$2.00 a Year Published Monthly 50c a Copy

FEB 17 1941

VETERINARY MEDICINE

MARCH, 1941

Synthetic Thiamin Chloride (Vitamin B_1)

Thiamin Chloride (Vitamin B_1) is more often deficient in the diet of dogs than any other vitamin. It is not stored in the tissues to any considerable extent and therefore the supply needs to be fairly constant. For these reasons, many dogs are continually on the margin of a deficiency of this and other vitamins of the B group, and suffer from such deficiencies in greater or less degree from any interruption of the supply, such as inappetence or fasting, or from any increase in the B_1 requirement, such as strenuous exercise, fever, increased carbohydrate intake or any condition that increases the metabolism. Oral administration of the vitamin constitutes adequate treatment when the digestive system is still functioning. For more acute conditions such as extreme nervousness or fright disease due to thiamin deficiency or to a combined deficiency of thiamin, nicotinic acid and riboflavin, the treatment should be given hypodermically. In fact, it is best to start the treatment of all acute cases in this way. Mild attacks of vitamin B_1 deficiency in the dog are characterized by timidity, nervousness, barking, irritability, moroseness, and stupidity. The appetite is usually depressed and as the deficiency becomes graver anorexia may be complete. The refined chemicals, thiamin chloride, nicotinic acid and riboflavin, are intended for therapeutic use in more or less acute cases. The yeast preparations as supplements to the ration are intended for the prevention of these deficiencies, and for treatment of the milder forms, not only in pets but in all farm animals, including poultry.

THIAMIN CHLORIDE (SYNTHETIC)

Vitamin B_1

Uses: For relief of B_1 avitaminoses.

Directions: The normal daily requirement of thiamin for a dog is approximately 250 USP units. This requirement is increased by rapid growth, pregnancy, lactation, debilitating disease, hard work, etc. The therapeutic dose is twice the normal requirement once daily; in very acute cases, for example in fright disease, give 500 USP units twice the first day and once daily thereafter until the animal is eating well.

Solutions for Hypodermic Use

(1cc contains 6,666 USP units of vitamin B_1.)

One 10cc vial (66,666 units B_1).....$ 3.00
Six 10cc vials 400,000 units B_1)..... 17.20

(Each cc contains 333 USP units of vitamin B_1.)

One 10cc vial (3,330 units B_1).....$0.65
Six 10cc vials (20,000 units B_1)..... 3.25
One 50cc vial (16,650 units B_1)..... 2.50

Tablets for Oral Administration

(1 mgm contains 333 USP units vitamin B_1.)

100 1/3-mgm tablets (11,100 units B_1).....$0.88
500 1/3-mgm tablets (55,500 units B_1)..... 3.25
100 1-mgm tablets (33,300 units B_1)..... 1.40
500 1mgm tablets (166,500 units B_1)..... 6.20

ELIXIR THIAMIN CHLORIDE

For Oral Administration

Uses: In pregnancy, lactation, anemia, certain gastrointestinal disorders, including diarrhea and constipation.

Directions: The same as for the use of thiamin chloride, when the intestinal tract is not gravely involved. It should be administered only when absorption from the digestive tract is possible.

Dose: One or more teaspoonsful as indicated.

(Each ounce contains 2,400 USP units thiamin chloride, 8.5 gm sucrose, and 10% alcohol.)

8-ounce bottle (19,200 units B_1).....$ 1.00
1-pint bottle (38,400 units B_1)..... 1.60
1-quart bottle (76,800 units B_1)..... 3.00
1-gallon bottle (307,200 units B_1)..... 11.50

NICOTINIC ACID

Tablets for Oral Administration

Use: For Prevention and treatment of canine blacktongue.

Directions: Two tablets per day for each 20 lbs. of body weight, or as otherwise indicated.

(Each tablet contains 30 mgm nicotinic acid.)

100 tablets (3,000 mgm nicotinic acid).....$0.75
500 tablets (15,000 mgm nicotinic acid)..... 3.00
1000 tablets (30,000 mgm nicotinic acid)..... 5.00

RIBOFLAVIN

Tablets for Oral Administration

Uses: Avitaminosis B_2.

(Each tablet contains 1 mgm riboflavin—400 S-B units vitamin B_2. Tablet bisected.)

100 tablets (100 mgm riboflavin).....$1.25
500 tablets (500 mgm riboflavin)..... 5.00
1000 tablets (1000 mgm riboflavin)..... 8.50

VITAMIN B-COMPLEX

Tablets for Oral Administration

Uses: Inappetence, dermatoses due to B-complex deficiency, canine blacktongue.

Directions: Two tablets per day for each 10 lbs. of body weight, or as indicated.

(Each 7.5-grain tablet contains 25 USP units B_1, 18 gamma riboflavin (B_2, G), 20 mgm nicotinic acid, plus all the other factors of vitamin B as found in brewer's yeast.)

500 7.5-grain tablets.....$ 2.00
1000 7.5-grain tablets..... 3.75
5000 7.5-grain tablets..... 18.50

Remarks: These tablets are made of the finest brewer's yeast and fortified with 20 milligrams of nicotinic acid.

VITAMIN B_1 AND B_2 (G)

Tablets for Oral Administration

Uses: Inappetence, avitaminosis B.

Directions: 5 to 10 tablets per day.

(Each 7.5-grain tablet contains 25 USP units vitamin B_1, 18 gamma riboflavin (B_2, G), and all factors of the B complex in brewer's yeast.)

500 7.5-grain tablets.....$1.00
1000 7.5-grain tablets..... 1.75
5000 7.5-grain tablets..... 1.25 per M
10000 7-5-grain tablets..... .85 per M

Remarks: These tablets are soft pressed. They break up easily. As a rule 70% of dogs will eat them from the hand. Note high content of B_1 in these tablets. They are suitable for dispensing.

BREWERS YEAST POWDER

Uses: As an addition to the ration to maintain proper vitamin B balance.

Directions: 3% to 5% of the ration.

(Each gram contains: 50-55 USP units vitamin B_1, 40-50 micrograms vitamin B_2 (G) riboflavin, 0.56 mgm nicotinic acid, plus the other factors of B complex found in brewer's yeast.)

1-lb. can .....$ 0.50
5-lb. can 2.10
25-lb. drum 6.75
100-lb. drum 24.00

Remarks: Do not buy brewer's yeast on price alone; insist on a statement of vitamin content on the label. Our yeast is specially prepared for medication and contains five to seven times as much vitamin B as some brands on the market.

MERILLAT-LAINE COMPANY, Inc.

1827 WABASH AVE. **CHICAGO**

ALL THREE

Available Under One Label

PARKE, DAVIS & COMPANY

Sulfapyridine

Supplied as 0.5 Gm. Compressed Tablets, No. 785, in bottles of 50, 100, and 1000; and as 0.25 Gm. Capsules, No. 466, in bottles of 50, 100, and 500.

Sulfanilamide

Supplied as 0.325 Gm. Compressed Tablets, No. 760, in bottles of 25, 100, and 500; and as 0.5 Gm. Compressed Tablets No. 762, in bottles of 100 and 500.

Sulfathiazole

Supplied as 0.25 Gm. Compressed Tablets, No. 797, in bottles of 100, 500, and 1000; and as 0.5 Gm. Compressed Tablets, No. 796, in bottles of 100, 500, and 1000.

PARKE, DAVIS & COMPANY

VETERINARY MEDICINE

Registered in U. S. Patent Office

VOL. XXXVI MARCH, 1941 No. 3

Published Monthly by the

VETERINARY MAGAZINE CORPORATION

7632 S. CRANDON AVE., CHICAGO, ILL., U. S. A.

$4.00 a year; per copy 50 cents; Special Issues $1.00

All matter appearing in this publication is copyrighted. No part of it may be reproduced without specific permission. Permission will be given if the purpose is unobjectionable. If there be any question as to the propriety of reproduction the author will be consulted.

Entered as second-class matter Nov. 8, 1920, at the post office at Chicago, Ill., under the Act of March 3, 1879. Entered as second-class matter under the title of American Journal of Veterinary Medicine July 19, 1910, at Chicago, Ill., under the Act of March 3, 1879.

D. M. CAMPBELL, *Editor*
7632 S. Crandon Ave., Chicago, Ill.
Telephone South Shore 7160

H. J. MOSTYN, *Eastern Representative*
1265 Broadway, New York, N. Y.
Telephone Murray Hill 4-4037

COPYRIGHTED, 1941, BY VETERINARY MAGAZINE CORPORATION

CONTENTS

Veterinary Faculty, Michigan State College....122
Veterinarians and the Public Health....123
Meat Production Increased....124
World's Largest Live Stock Market....124
Robert von Ostertag, Father of Modern Meat Inspection, Dies....125
Veterinary Hospital Practice of Dr. K. U. Jones....126
First Herd of Iowa Swine Given Simultaneous Injection for Erysipelas....128
Montana Live Stock Notes....130
Still Gypping Cattle Raisers....131
Big Game Animals Are Holding Their Own....132
The Newspapers Say—....134
White Snakeroot Poisoning in Arkansas—E. L. Nielsen and D. F. Eveleth....136
Treatment of Mange in the Horse....138
Recent Materia Medica. VIII. Vitamin B Complex—Victor Lewitus....139
Problems of Anesthesia in Small Animals—H. J. Mostyn....144
Treatment of Allergies with Histaminase—J. Gilbert Horning....155
The Fundamental Role of Thiamin in Canine Nutrition—John W. Patton....156
Sheep Nutrition—L. D. Frederick....164
Abdominal Rupture from Goring—Jack Medaris....171
Diaphragmatic Hernia in a Cow—Roy L. Mesenbrink....172
Dystocia Due to Complete Occlusion of the Vagina—G. J. Marold....172

THE FRONT COVER

Well, it's your guess. The veterinarian (right) is one of the most widely known members of the profession, and the farm, which belongs to a well-known professor of agriculture, has been visited by many veterinarians and hundreds of veterinary students.

VETERINARY MEDICINE

Registered in U. S. Patent Office

VOL. XXXVI MARCH, 1941 No. 3

The sale of vitamin products in drug stores increased from $500,000 in 1933 to $75,000,000 in 1939.

Our present knowledge of genetic disease resistance in poultry must be put to work, while comprehensive investigations are being carried out.

The poultry industry of the United States is a billion-dollar industry. The volume of business it does has increased steadily during the last 20 years and has probably doubled in the last decade.

It appears from a recent investigation by Zechmeister and Cholnoky that the yellow coloring matter naturally present in wheat is not carotene, as formerly supposed, but largely xanthophyll, which is related to carotene but has no vitamin A activity. Wheat flour may therefore be considered insignificant as a source of vitamin A.

Milk is the most important source of riboflavin (vitamin G) in ordinary human diets. Although essential to adequate nutrition and growth, as are most of the other vitamins, riboflavin might with considerable propriety be called the longevity vitamin. Its deficiency in experimental animals appreciably shortens their lives and induces, prematurely, symptoms of senility.

Until recently most of the whey produced by the cheese factories was poured down the sewers. Now it is saved and dried for its vitamin G (riboflavin) content. Poultry have a high requirement for riboflavin and poultry growers value milk products in the ration more for the riboflavin they contain than for anything else. The greenish yellow color of whey is due to riboflavin.

The incorporation of cottonseed oil in the ration of hens reduces the hatchability of their eggs as much as 60%.

Other things being equal, pullets hatched in June and September produced larger eggs than those hatched in other months. November- and January-hatched pullets produce the smallest eggs.

Female puppies have shown a definitely greater tolerance of vitamin D deficiency than male puppies in several experiments. Stockard concludes that the females possessed an inherent superiority in calcium metabolism. In all diets in these experiments upon which rickets developed the disease was more pronounced in male than in female puppies.

Tuberculosis has been declining steadily for a hundred years. It has declined 76% in the United States in the last 40 years and was probably under 45 per 100,000 population in 1940. Historical studies suggest that epidemologically tuberculosis, like most other infections, runs a cyclic course, but the cycle is more than 200 years! In nearly all parts of the world where statistics are available the mortality has declined since the first half of the 19th century.

The *Prairie Farmer*, Chicago, celebrated its 100th anniversary January 11th. The publication was started in January, 1841, and has not missed an issue. The centennial issue contained 192 pages. A hundred years ago the prairies around the frontier town of Chicago were worth $1.25 an acre and were broken with wooden moldboard plows. Wheat was harvested with a cradle and threshed with flails. Tomatoes were ornamental plants.

VETERINARY FACULTY, MICHIGAN STATE COLLEGE

Front Row (left to right): Myrtle Munger, M.S., Laboratory Technician in Bacteriology; Marjorie B. Fulton, B.S., Research Assistant in Bacteriology; Cathryn Bertram, Stenographer; Betty Bergin, Stenographer; Ward Giltner, D.V.M., M.S., D.P.H., Dean of Veterinary Science, Professor of Bacteriology and Hygiene, Bacteriologist; I. F. Huddleson, M.S, D.V.M., Ph.D., Research Professor of Bacteriology; Lisa Neu, Technician; Mary Anderson, Secretary; Carolyn R. Cox, B.S., Assistant in Bacteriology; Norma Mull, Stenographer

Second Row (left to right): B. B. Roseboom, Professor of Physiology and Pharmacology; C. S. Bryan, Ph.D., Instructor and Research Assistant in Bacteriology; L. B. Sholl, B.S., D.V.M., M.S., Associate Professor of Animal Pathology, Research Assistant; J. F. Sykes, Ph.D., Instructor in Physiology, Research Assistant; M. C. Van Wormer, B.S., Research Fellow in Bacteriology; C. W. Darby, B.S., D.V.M., Instructor in Bacteriology; Harold Redman, Animal Caretaker; R. F. Langham, A.B., M.S., Instructor in Pathology, Assistant in Animal Pathology; C. F. Clark, D.V.M., Assistant Professor of Pathology, Research Assistant; E. D. Devereux, Ph.D., Assistant Professor of Bacteriology; H. J. Stafseth, M.S., D.V.M., Ph.D., Professor of Pathogenic Bacteriology

Third Row (left to right): William H. Stahl, M.S., Ph.D., Research Assistant in Bacteriology; W. L. Mallmann, Ph.D., Professor of Sanitary Bacteriology, Research Associate in Bacteriology; A. C. Corbett, B.S., M.S., D.V.M., Instructor in Bacteriology and Research Assistant; S. D. Kramer, M.D., Ph.D., Lecturer in Virus Diseases; Charles E. Black, M.D., M.S., Lecturer in Clinical Pathology; F. W. Fabian, Ph.D., Research Professor of Bacteriology; Clyde F. Cairy, D.V.M., Instructor in Veterinary Pathology; Philip A. Hawkins, A.B., M.A., Instructor in Parasitology and Research Assistant; Ralph Humrich, Animal Caretaker; B. A. Alfredson, D.V.M., Assistant Professor of Physiology and Pharmacology; E. S. Welsner, B.S., M.S., D.V.M., Extension Specialist in Poultry Pathology; Wade Brinker, D.V.M., Instructor in Surgery and Medicine

Back Rows (left to right): Wm. Gebhard, B.S., Graduate Assistant in Bacteriology; F. W. Young, D.V.M., M.S., Assistant Professor of Anatomy; M. B. Kurtz, D.V.M., M.S., Lecturer in Serology; Wm. S. Boniece, B.S., Graduate Assistant in Bacteriology; J. R. Stiefel, M.S., Instructor in Physiology; R. V. Brown, B.A., M.S., Assistant Professor of Physiology and Pharmacology; C. L. Tripp, Ph.D., Lecturer; J. F. Ryff, D.V.M., Instructor in Bacteriology and Research Assistant; H. E. Cope, B.S., M.D., Lecturer in Clinical Pathology; W. C. Watrous, A.B., Ph.D., Instructor in Physiology; C. B. Line, D.V.M., M.S., Lecturer in Serology; Joseph M. Donaldson, D.V.M., Assistant in Anatomy and Surgery and Medicine; Charles San Clemente, B.S., M.S., Fellow in Bacteriology; H. E. Johnson, D.V.M., Associate Professor of Comparative Anatomy; Hans Ruhland, D.V.M., Assistant in Animal Pathology, Pathologist to State Department of Agriculture; J. P. Hutton, D.V.M., Professor of Surgery and Medicine; F. J. Erickson, B.S., Research Fellow in Bacteriology; John Cunkelman, B.S., D.V.M., Instructor of Anatomy; J. O. Mundt, B.S., M.S., Graduate Assistant in Bacteriology; E. R. Doll, B.S., M.S., Part-time Assistant in Animal Pathology; L. M. Hutchings, B.S., D.V.M., Spec. Agent for U. S. B. A. I.; E. T. Hallman, D.V.M., Professor of Animal Pathology and Animal Pathologist; B. J. Killham, D.V.M., Extension Specialist in Veterinary Medicine, Lecturer in Veterinary Jurisprudence; F. W. Chamberlain, B.S.,

(Continued at bottom of next page)

Veterinarians and the Public Health

"The importance of Veterinary Medicine to Public Health" is a favorite topic of discussion when public health officials or other physicians appear on programs of veterinary meetings or banquets. The same subject is frequently discussed by veterinarians before medical and other audiences. It is invariably well received and applauded. It makes a good story. Some 60 or more diseases and parasitisms of animals are communicable to man. Animals constitute the natural reservoir of certain diseases to which man is susceptible and there is no prospect of controlling or eradicating them in man except as veterinary medicine is able to control them in their natural hosts or eradicate the infection from the animal reservoir. In addition, there is the wholesomeness of the public's food from animal sources to be assured; surely a task for which the veterinarian is better trained than the members of other professions or the untrained.

To accomplish these purposes it would appear that a veterinary member of every state board of health is not only logical but well-nigh indispensable. An examination of the personnel of such boards, however, shows that only one in 17 has such a member. It causes one to wonder how much of these postprandial felicities is sincere and how much is just pleasantry.

Of 53 state and insular departments of health only six (Arkansas, Mississippi, New Jersey, Oklahoma, Pennsylvania and Puerto Rico) have milk control or milk sanitation divisions. Of these six, in only two, Mississippi and New Jersey, is this division in charge of a veterinarian. In two states, Arkansas and Oklahoma, the director of the milk control division has the degree of B. S. In the remaining two the director has no scholastic degree.

Twelve of the state and insular public health departments have food and drug divisions, some of which undoubtedly do, but most of which probably do not, concern themselves with milk sanitation. Of these essential food inspection departments only one, that of the District of Columbia, is in charge of a veterinarian; in four states (Maryland, Massachusetts, New Jersey and Montana) the directors have the degree of B. S.; in three (California, Colorado and Puerto Rico), pharmacy degrees; in one (Indiana) the degree of A.B.; in one (Kentucky), M.S.; and in two states (Kansas and Missouri) a college training is considered unnecessary for the directors of the food and drug departments of the state board of health.

Since two of these health boards, those of New Jersey and Puerto Rico, have both food and drug and milk sanitation divisions, it follows that in only 16 of the 53 states, insular possessions, and the District of Columbia are food and drugs regarded as of importance to the public health, and in only three of the 53 are diseased animals and their products thought anything to worry about—only three have veterinarians in major administrative posts.

The organization of the various health departments is quite uniform. Most of them contain divisions on business administration, child hygiene, industrial hygiene, epidemiology, maternal and child health, dentistry, engineering, venereal disease, laboratories, records and statistics, and public health nursing; and less frequently cosmetology, tuberculosis, chemistry, narcotics, legal administration, cancer research, mental hygiene, etc.

D.V.M., Professor of Comparative Anatomy; Frank Thorp, Jr., D.V.M., M.S., Ph.D., Research Associate in Animal Pathology; E. S. Conklin, D.V.M.; G. L. H. Weaver, D.V.M.; W. W. Miller, D.V.M., Assistants in Animal Pathology; E. K. Sales, D.V.M., Associate Professor of Surgery and Medicine

Members of the veterinary faculty not present when the photograph was taken are: E. E. Visger, M.B., D.V.M., M.D., Instructor of Anatomy; S. C. Whitlock, D.V.M., M.S., Lecturer in Pathology; Louis Camillo, B.S., Research Assistant in Bacteriology; Dean Fluharty, B.S., and W. M. Strong, D.V.M., Part-time Assistants in Bacteriology; D. B. Meyer, D.V.M., M.S., Lecturer in Immunology; G. D. Cummings, Ph.D., Lecturer in Public Health Laboratory Methods; W. F. Riley, B.V.Sc., D.V.M., Instructor in Surgery and Medicine; and W. L. Chandler, Ph.D., Assistant Professor of Parasitology (on leave). Five staff members of the Division of Animal Husbandry, four of Dairy Husbandry, four of Poultry Husbandry, two of Chemistry, one of Botany, and five of Military Science, who are not shown in the picture, also instruct veterinary students

Meat Production Increased in 1940

Production of all meats dressed under federal inspection during 1940 was about 10% greater than in 1939, and about 15% greater than the average production during the five-year period, 1929-33, according to estimates by the American Meat Institute. The principal increase was in pork.

Meat for the Army

Canned meat contracts totaling $2,479,741 were recently awarded to ten packing companies by the Chicago Quartermaster Depot for the U. S. Army during the first quarter of 1941. The contracts call for approximately 3,000,000 cans, tins and glass jars of corned beef, corned beef hash, sliced dried beef and sausage.

World's Largest Live Stock Market

The Union Stock Yards at Chicago were 75 years old on Christmas Day, 1940. A total of 896,000,000 animals, or an average of a million per month since the yards were opened, have been sold on this market for the enormous sum of $21,500,000,000. It is by long odds the largest of live stock markets; more than 300 buyers are in attendance every day. Before the establishment of the U. S. Yards there were seven live stock markets in Chicago, the most important of which was the Drovers Union Yards. Commenting on the history of live stock marketing and present trends the *National Live Stock Producers* says:

From time to time changes have been made to meet new conditions [in the U. S. Yards] but the basic plan has always remained the same. This is eloquent tribute to the fact that the concentration of a large volume of live stock at one point which would attract a sufficient number of buyers for all classes and grades of live stock so that values would be fairly determined in free and open competition is the most economical way for a producer to sell his animals. The trend in recent years to a decentralization of live stock trading is merely reverting to the practices of a bygone day and one need only look at the pages of history to learn what unsatisfactory conditions would result if this trend were followed to an extreme. Producers had such a situation in Chicago up to the close of the Civil War, and the systems of direct selling and scattered markets which had been tried out had all proved to be based on a weak foundation. It was not until the live stock business of Chicago was fully concentrated at one great central market that a solution was found which has stood the test throughout three-quarters of a century.

The meat consumption in the United States is approximately 133 pounds per person per year, exclusive of the flesh of game, poultry, small animals and fish.

Many preparations will cure mange in swine, but none is more effective or less expensive than ordinary lime and sulphur dip.

War with the Soviet Union caused Finland to lose nearly 170,000 cattle, 153,000 sheep, 75,000 pigs and 13,000 reindeer.

Sulfapyridine is a better weapon against pneumonia than sulfathiazole, although the latter appears to be less toxic. Sulfathiazole, on the other hand, gives better results in treating infections caused by *Staph. aureus.*

Nearly 50,000 animals are handled yearly at the Angell Memorial Animal Hospital, Boston, which is operated by the Massachusetts Society for the Prevention of Cruelty to Animals. The hospital deficit each year amounts to more than $40,000. "Hundreds of people cannot pay for the treatment of their animals. Many will not pay, some give fictitious names or addresses."

"Where articles of food are sold for domestic use and immediate consumption, the law implies a warranty that such articles are sound, wholesome, and fit to be consumed, and if the consumer is made sick through the consumption of such food, he has a right of action against the vendors thereof, either for breach of implied warranty, or for negligence; and in such action it is unnecessary either to allege or to prove scienter."—From an opinion of the Washington Supreme Court in affirming judgment against a milk distributor because of an attack of undulant fever contracted from milk of cows affected with brucellosis.

Robert von Ostertag, Father of Modern Meat Inspection, Dies at 76

Professor Dr. Robert von Ostertag, whose long and fruitful career entitles him to a preeminent position in the annals of veterinary medicine, both for notable service to the veterinary profession and for outstanding contributions to human welfare, died October 10, 1940.

Robert von Ostertag was born March 24, 1864, in Schwäbisch-Gmünd, Germany. He was graduated from the Veterinary College of Stuttgart in 1884, and the following year was appointed to the meat inspection service at the Berlin abattoir. In 1891 he returned to the Stuttgart school as a lecturer, and in 1892 received an appointment on the faculty of the Veterinary College of Berlin, where he taught for 15 years. In 1907 he was appointed Director of the Veterinary Department of the German Ministry of Health. During the war of 1914-18 he served his country, first as regimental veterinarian for a field artillery regiment, then as chief veterinarian in Brussels during the German occupation of Belgium, and from 1916 until the end of the war as director of the Meat Inspection Division in Berlin. Following the war he acted in an administrative and advisory capacity in the German Ministry of Food and Agriculture until 1920, when he returned to the state of Württemberg as Departmental President of the Ministry of the Interior, remaining in this position of distinction until retiring in 1933 at the age of 69.

During his career von Ostertag traveled extensively, visiting most of the countries of Europe, as well as Africa and North and South America, as a lecturer and as an advisor in problems of disease eradication and food inspection. He visited the United States twice, in 1904 to study methods of meat inspection, and in 1934 as German delegate to the 12th International Veterinary Congress in New York. The picture above was taken when he visited the Chicago Stock Yards during his second trip to this country.

Of his contributions to veterinary literature, his classical *Handbook of Meat Inspection,* now in its eighth edition, is known to veterinarians in every country in which there is some form of food hygiene. Even as late as 1940, in his 77th year, he was joint author with Moegle of a new book, *Die Tierkörperbeseitigung* (Animal Body Disposal); this year also marked the 50th anniversary of the journal which he founded, the *Zeitschrift für Fleisch- und Milchhygiene.* He was also co-editor of the journal *Ergebnisse der Allgemeinen Pathologie und Pathologischen Anatomie.*

Prof. Dr. Robert von Ostertag

In the course of his life von Ostertag received many honorary degrees and decorations, including the Adlerschild (Eagle Shield) and the Goethe Medal, two of the highest German distinctions for achievements in art and science. He was a member or honorary member of many veterinary, agricultural, and other scientific societies, including the A. V. M. A., and an Honorary Associate of the Royal College of Veterinary Surgeons [England].

His work complemented that of Robert Koch in the field of tuberculosis control; he devised procedures for tuberculosis eradication, and was instrumental in the founding of a number of bacteriological institutes in Germany as a necessary part of the campaign against that disease. He was again associated with Koch in 1913 in the organization of the fight against rinderpest in German East Africa. On the occasion of his 70th birthday his bust in bronze was mounted next to Koch's in the German Ministry of Health.

The "Robert von Ostertag Plaque," dedicated at the first German Veterinary Congress in Berlin in 1937, has been conferred as a high honor on several outstanding German veterinarians.

This group of visitors to Doctor Jones' hospital includes (left to right): Drs. Hamlet Moore, New Orleans; L. E. Starr, Auburn, Ala.; S. W. Haigler, St. Louis, Mo.; and R. H. Stewart, State College, Miss.

During the meeting of the Southern V. M. A. in Birmingham recently, a considerable number of the visiting veterinarians called at the animal hospital of Dr. K. U. Jones. The halftone above shows one such group. Considerable interest was manifested in Doctor Jones' procedure in admitting dogs to his hospital. Most of the dogs brought to veterinarians in that section of the country have ticks and many of them are infested also with fleas and some with lice. To benefit the animal and to prevent contamination of his premises dogs are dipped routinely on admission.

A 60-gallon steel drum about two-thirds full of an arsenical dip is always at hand and into this the dogs are dipped before being taken into the various wards, unless there is a valid reason for not dipping them. The dipping frees them of ticks, fleas and lice and clears up many skin troubles. It is inexpensive and can be changed often—a desirable feature, since dirt accumulates in it. The dip is made by adding one quart of Wm. Cooper & Nephews' arsenical cattle dip to 44 gallons of water. This makes a dip that tests about 0.0017. To be effective the dip should not test below 0.0015; to be safe for dogs with tender skins it should not test above 0.0018.

The manufacturer supplies a starch tablet and iodine test fluid (N/20) which should be used according to directions, not only when a fresh batch of the dip is made up but from time to time as it is used. The test is very easily and quickly made.

A dog dipped in this solution should never be placed in a cage with a tight floor, according to Doctor Jones, but in a cage with about a one-inch mesh floor, so that all drippings will drain out and should the dog defecate or vomit the feces or vomitus will drain away also. In warm weather dogs may be placed in open runs where they will

shake and dry quickly. When a cage is used an electric heater is placed over it, and in half to three-quarters of an hour the dog is about half dry and may be dried with an electric blower and the coat combed out to go home.

Care must be exercised when using this dip on dogs with moist eczema or similar infections of the skin, large open sores, pocket wounds, etc.; also on dogs with long hair, especially around the scrotum. The latter should have an application of oil or vaseline to the scrotum before they are dipped to prevent scalding or burning. It is a good plan to make sure the dog has something in its stomach before dipping, even if it is necessary to wait to feed it, since it will invariably lick itself after dipping and vomit. The mouth should be tied shut while the animal is in the dipping vat.

Dogs should not be dipped again in this solution in less than seven days, since dipping at shorter intervals will lead to arsenical absorption.

Where dipping is contraindicated, Doctor Jones uses the following prescription for fleas and ticks on dogs:

℞

Oil of Wintergreen	ʒ I
Pyrethrum (1 to 20 extr.)	ʒ XVI
Gum Camphor	ʒ VIII
Denatured Alcohol (955) q.s.	ad Cong. I

Dissolve the camphor in the alcohol, mix, and apply externally.

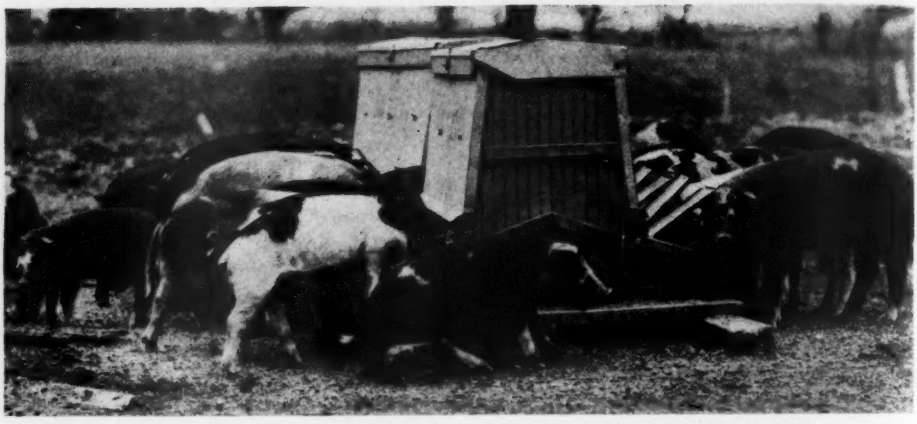
Doctor Jones uses an ingenious device for supplying heat to his cages. It is entirely homemade. A five-gallon can or drum is cut lengthwise into halves. These are used for reflectors, and as the heating units are placed on the tops of wire-covered kennels reflectors are placed with the convexity upward. In the concave side are placed two cross members of metal to which are bolted two black iron heating elements 12 inches long. These are connected to a three-way switch as follows: one (low) is connected direct; medium is connected so the two will be in series; high is connected so the two will be in parallel—that is, so both will give full heat instead of about half, as in series. High will make a closed cage quite hot, and in most cases medium or low is sufficient. These heaters are used wherever heat is desired, as after operations, recovering from nembutal or other anesthetics, following normal saline injections, etc.

The illustration on the preceding page shows Doctor Jones' method of aftertreatment for trimmed ears. Firm rolls of cotton about one-half to three-quarters inch in diameter are wrapped in gauze and placed in the ears after the operation to hold them straight. The roll of cotton is of the same length as the ear after trimming. After placing the gauze around the cotton it is cemented together with rubber patching cement and allowed to dry. The ear is always cleaned with ether to remove any grease and the inside of the ear is coated with this same patching cement and allowed to dry. The roll is then placed well down in the concha; the ear being stretched upward. The roll is pressed back against the coated surface and the ear folded around it in order to cup the cartilage. All is held in place by narrow strips of adhesive tape placed snugly but not tightly around the ear at the base, at the middle, and near the top. If gauztex is used, apply rubber cement to the ear and use the bandage in the same way.

This method of treatment leaves the cut surface open to the air and permits it to be treated. It also allows the dog to use the ear muscles and thus keep them active and developing.

"I find this method very satisfactory because it is light in weight; holds the ear straight; allows the cut edge to be treated; permits air to reach the inner surface to keep down sweating such as occurs when adhesive tape alone is used; allows free use of the ear muscles and permits their development to hold ear erect; the dog usually does not object and try to scratch it out (although some do); and lastly it can be used over a longer period of time than most other methods in training the ears to stand erect. The bandages should be reset every four or five days during the training period."

The same dressing is suitable after operating for hematoma of the ear.



A portion of the first herd of hogs in Iowa to be given the culture-serum simultaneous anti-swine erysipelas vaccination. Note that the pig in the foreground is relieving his hind feet by sitting on the self-feeder support and is standing on his toes in front. Soreness of the foot pads is of common occurrence in swine erysipelas. Enlargement of the left hock may be noted in the mostly white pig just beyond. Others in the group had enlarged, painful joints

The accompanying illustrations are from photographs taken at a farm near Stratford, Iowa, November 4, 1940, where a herd of pigs was simultaneously injected with a culture of *E. rhusiopathiae suis* and anti-swine erysipelas serum; the first herd in Iowa so treated.

The work was done in cooperation with the federal Bureau of Animal Industry, the State Veterinarian, and the local veterinarian, Dr. M. E. Pomeroy and, of course, the owner of the swine, Mr. Veggors, and follows the pattern used in Nebraska for some time; that is, that a farmer petitions

The men wearing hats are (left to right): Dr. M. E. Pomeroy, Stratford, Ia.; Mr. Veggors, the owner of the pigs; Dr. H. A. Seidell, State Veterinarian, Des Moines, Ia.; Dr. J. A. Barger, Inspector in Charge, Des Moines; Dr. H. J. Shore, Ft. Dodge, Ia.; and Dr. J. S. Koen, B. A. I., Storm Lake, Ia.

through his veterinarian to have his herd immunized with a culture of *E. rhusiopathiae* suis and anti-swine erysipelas serum. This is carried out when the state veterinarian and the inspector in charge for the federal Bureau of Animal Industry in the state approve it. All cultures are prepared in the field laboratories of the Bureau and released only in cases handled in this manner.

A number of veterinarians from north central Iowa, in addition to those shown in the halftone, were present at the farm on this historic occasion. Mr. H. M. Nichols, County Agent of Hamilton County, Iowa, and a few farmers from the surrounding territory also attended. It had previously been determined by Dr. J. S. Koen that some pigs in the herd were affected with swine erysipelas. The general condition of the herd on the day of treatment was fair. It was reported by the attending veterinarian, Doctor Pomeroy, the day after treatment that the condition of the herd was greatly improved and within a very short time practically all the animals were in normal condition.

* * * *

In the case of lameness in swine, even though several animals may be affected and one is inclined to say swine erysipelas, examine the foot-pads carefully. Sometimes that is where the trouble lies.

* * * *

Hog cholera, salmonellosis and swine erysipelas are the three outstanding infectious diseases of swine in this country and are to be eliminated before a diagnosis of any other ailment is made when one is called to see a herd of sick hogs.

* * * *

Although there are differences in the lesions of hog cholera, acute swine erysipelas and salmonellosis, the differences are insufficient for differential diagnosis; all show lesions of septicemia. The history, symptoms, and surroundings must be taken into consideration along with the lesions to make possible a differentiation between these three diseases.

In addition to being a source of annoyance to swine, lice may contribute to the spread of disease. Some have noted that swine pox spreads rather rapidly through a herd infested with lice, but spreads little or not at all among uninfested animals.

* * * *

Sulfanilamide is immediately curative in many cases of acute mastitis in swine. Give a 200-300 pound sow 150 grains the first day and 75 grains daily for the next three or four days. The condition often clears up in 24 to 48 hours with complete restoration of the milk flow.

* * * *

Piles in swine can usually be relieved by scraping off all the extruded mucous membrane. Use local anesthesia. Sometimes it is necessary to use a purse-string suture about the anus for a few hours to prevent eversion of the rectum from straining.

Skin form of swine erysipelas.—*Photo courtesy of Dr. Joe W. Giffee, Cedar Rapids, Ia.*

Montana Live Stock Notes*

There was no glanders, dourine, periodic ophthalmia, trichinosis, or rabies in Montana during 1940; no horse or sheep scab, and no cattle scabies except for four minor outbreaks due to four imported bulls. No case of rabies has been reported in the state since 1925.

The *Corynebacterium ovis* was demonstrated for the first time in the state as a cause of abscesses (chest disease) in horses. A considerable number of cases occurred. The abscesses appear principally on the chest and the condition bears some clinical resemblance to ulcerative lymphangitis.

Ninety cases of equine encephalomyelitis were reported and four deaths from anaphylactic shock following vaccination for the prevention of this disease.

During the year 35,252 cattle were tuberculin tested and 16 (0.045%) reactors revealed. In addition two reactors were revealed among 185 imported cattle that were tested.

Calfhood vaccination for the control of brucellosis in cattle has been employed officially for several years. Now that this method has received official recognition from the federal B. A. I. it is believed the disease can be controlled in Montana within a reasonable time and that its ultimate eradication is definitely attainable.

Coccidiosis makes its appearance among Montana cattle herds during the fall and winter seasons following inclement weather and a change of feed. It is characterized by a bloody diarrhea. The treatment recommended is eight to 21 ounces of a 1% copper sulphate solution followed in a few hours with a pint of mineral oil. Place the animals on upland pasture till recovery is complete.

One outbreak of anthrax (in cattle) occurred. It was quickly suppressed with the loss of 17 animals of a herd of 750.

Bacterial ictero-hemoglobinuria (red water) was diagnosed for the first time in Montana cattle. The outbreak occurred on a ranch which had imported some apparently healthy cattle from a district where the disease is indigenous. Repeated vaccination was the control measure employed.

Pulmonary emphysema in cattle received continued study, but the question as to whether it is of bacterial origin remains undecided. The occurrence of the disease in Montana is invariably preceded by a change in feed.

Filariasis in cattle was recognized for the first time in 1940. It is characterized by a dermatitis of the umbilical region followed by an abscess. The abscesses of filariasis reach an enormous size, extending to the brisket. *Stephanofilaria stilesi* are found in the original lesion and *Corynebacterium ovis* in the abscesses.

Cysticercosis (measles) is reported frequently in cattle fed beet tops in districts where Mexicans and Filipinos are employed in beet field operations.

Infectious keratitis in cattle was prevalent during the year. Heretofore this disease has been attributed to vitamin A deficiency and hot, dry weather. Neither prevailed during the past year and the unusual prevalence of the disease is unexplained.

Blackleg occurred to a considerable extent in old as well as young cattle. It is recommended that where suckling calves are vaccinated they be revaccinated after weaning.

Foot rot in sheep was observed in a number of cases, mostly in small farm flocks, during the past year. This is a condition that can be quite readily handled if reported immediately and energetic steps taken to eradicate it. In the treatment of foot rot every sheep should be handled and all four feet examined. Wherever there is indication of infection the sole must be pared away and the diseased tissue exposed. In treating the disease either butter of antimony or a saturated solution of copper sulphate is suggested. Medication is of little or no value, however, unless the sole is pared so that all diseased tissue may be exposed.

For the first time in the history of the state Johne's disease was diagnosed in sheep. It is recommended that all visibly

* From the report of the Montana Live Stock Sanitary Board for the fiscal year ending Nov. 30, 1940. W. J. Butler, Executive Officer, Director of Laboratories and State Veterinary Surgeon.

affected animals be shipped for slaughter and that the remainder of the flock be given a liberal ration of bone meal to each 100 pounds of which has been added a half-ounce of potassium iodide and six drams each of cobalt chloride, manganese peptonate, copper sulphate and ferrous sulphate.

Hog cholera occurred on 44 premises. In practically all cases it was due to feeding garbage. One case of swine erysipelas was reported.

Meat inspection was provided for one municipality during the year and 48 slaughter house licenses were issued.

During the year 46,565 specimens were examined in the laboratory. The material consisted of blood, milk, cream, water, bonemeal, meat, insects, parasites, tissues, skin scrapings, pus, exudates, feces, and feeds. The species of animals represented by these specimens were sheep, cattle, horses, swine, beaver, turkeys, ducks, swan, goats, rabbits, cats, foxes, dogs, deer, grouse, muskrats, fish, pheasants, and elk.

Still Gypping Cattle Raisers

Drs. A. B. Crawford of the federal Bureau of Animal Industry and B. A. Beach of the University of Wisconsin recently made a very thorough official test of two preparations widely advertised for the cure and prevention of abortion in cattle. Both "Crawford 3-V Tonic," manufactured by the Crawford Co., Winona, Minn., and "Bowman's" product, manufactured by the Bowman Laboratory, Owatonna, Minn., were found to be worthless for the purposes claimed.

An analysis of 3-V Tonic made by the United States Food and Drug Administration showed it to consist essentially of lime, basic magnesium carbonate, charcoal, a soluble compound of sulphur and calcium, probably calcium hyposulphite, small proportions of ferrous sulphate, sulphur, and powdered linseed, and a smaller proportion of powdered ginger.

An analysis of the Bowman's product by the United States Food and Drug Administration showed it to be a light-brown granular material containing sugar (sucrose), 90.3%; invert sugar, 4.3%; wood creosote, 0.1%; ash, 1.5%, and moisture by difference. No other ingredients were detected.

W. J. Butler, State Veterinary Surgeon of Montana

Sixty pregnant, brucellosis-free heifers were used for the 3-V Tonic test. They were divided into three groups of 20 each. Group I was fed one-half ounce of the 3-V Tonic daily for 75 days. Forty-eight days after beginning the test all three groups were exposed to *Br. abortus* infection by instillation into the conjunctival sac of one eye. Thereafter Group II received the 3-V Tonic in the same manner as Group I for 75 days. Group III—the control group—was not medicated.

The test of Bowman's product was carried out in a similar manner, being given according to the directions of the manufacturer to 20 pregnant heifers, and 20 were used as controls.

The abortion rate was high in both tests —as high in the treated as in the control groups.

According to Drs. Crawford and Beach, "3-V Tonic was ineffective in preventing pregnant heifers from becoming infected with brucellosis or in preventing them from aborting after having acquired the disease."

The conclusion as to Bowman's product was: "The results of the experiment definitely show that the product was ineffective either in prevention or in cure of brucellosis."

Big Game Animals Are Holding Their Own

More than 5,800,000 big-game animals are in the United States, the Fish and Wildlife Service reported recently. The figures were based on the third nation-wide big-game inventory conducted by the Fish and Wildlife Service with the cooperation of federal, state and private agencies. Sixty per cent of all the big-game animals are on state and private lands.

The maintenance of the big-game population is due in no small part to definite efforts at conservation by federal, state and private agencies. These elk are being unloaded on a Wyoming game reserve

Compiled for the year 1939, the present figures are 201,000, or 3.4% less than those compiled for the country's big-game population for 1938, but it is believed that the difference is insignificant and does not necessarily represent a decrease in game species. Some of the apparent losses are known to be due to corrections of certain estimates in last year's inventory, while others may be due to more conservative estimates.

As in previous years, the white tailed deer lead the big-game list with 3,578,000 of these animals reported from 44 states. Second and third most numerous big-game species are the mule deer, nearly 1,400,000 of which are estimated to be in 17 states, and the Columbian black-tailed deer, with a population of 301,200 scattered through three states.

Leading the states in big-game is Michigan, with a total of 839,800 animals, 835,000 of which are white-tailed deer. Pennsylvania is second with 827,300; Wisconsin, third with 513,000; California, fourth with 502,400; and Minnesota, fifth with 461,200.

Elk rank fourth in the big-game lists, with a population of 201,300 in 28 states. Wyoming has 57,800 of these animals; Colorado is second with 30,000; and Oregon is third with 28,000.

The speedy prong-horned antelope ranks fifth, with an estimated population of 164,900 in 16 states. Wyoming has the most pronghorns, recording 34,700; New Mexico is second with 27,000; and Oregon third with 25,700.

With 105,100 black bears reported in 33 states, this species places sixth in the big-game inventory. The state of Washington with 17,400 had the largest number. California came second with 16,200 and Minnesota third with 8,500.

The remaining big-game animals fall below the 50,000 mark, with the peccary, or

javelina, ranking seventh with 49,800 individuals. Texas records 35,100; Arizona 14,300; and New Mexico 400.

Two species are almost tied for eighth place. The moose population, estimated at 14,200, is found in Minnesota (5,100); Wyoming (3,500); Montana (2,500); and six other states. Some 14,150 mountain goats

A Young Antelope

are reported in four states. Washington leads with 5,800 mountain goats; Montana is second with 5,200; Idaho, third with 3,000 and South Dakota last with 23.

Some 8,300 rocky mountain bighorn sheep are found in nine states. Wyoming has the largest number of bighorns, 2,400; Colorado is second with 2,200, and Idaho, third, with 1,700. Desert bighorns rank tenth with a total of 5,300 in five states. California leads with 2,000; Arizona is second with 1,800; Nevada, third, with 1,100; New Mexico, fourth, with 250, and Texas, last with 150.

Buffaloes, the only big-game animals in captivity that are included in the inventory, rank eleventh with 3,300 bison in 17 states. Wyoming is first with 850; Oklahoma, second with 720, and South Dakota, third with 518.

The exotic European wild boar is in twelfth place with 1,600 animals in seven states. North Carolina has 600 of the introduced boars; Tennessee is second with 500, and California, third with 200.

In thirteenth place is the grizzly bear with a population of 1,100 in seven states. Most of the grizzlies are found in Mon-

There are 3,300 buffaloes (or, more properly, bison) in the United States, according to the last inventory

tana, which reports 600, and Wyoming, with 480.

The smallest population in the big-game inventory is credited to the woodland caribou, 15 of which are in Minnesota.—*The American Field.*

The fundamental training of the veterinarian fits him for a better understanding of the problems of health and disease in wild animals than that of any other person; but this basic training needs to be supplemented by a familiarity with some of the details of species and family characteristics of the forms of wild life. The veterinarian's specialized training enables him to perform autopsies on wild animals and to diagnose the disease and supervise means of prevention and treatment. Problems that arise in this field of veterinary activity call for all the ingenuity and resourcefulness one is capable of developing. The contacts made with persons attracted to this branch of animal knowledge are eminently worthwhile. The remuneration useful work in this field commands is comparable to that in any other field of veterinary medicine, and there is less competition.—*E. J. Frick*

The Newspapers Say—

Veterinarians Are Building

Dr. J. D. Williams has opened a new hospital for large and small animals in Colorado City, Texas. The building and grounds occupy two acres and the hospital is the best equipped in that section of west Texas.

Drs. R. O. Rothermel and J. H. Mosher have equipped an animal hospital in Kutztown, Pa. Facilities are provided for caring for both large and small animal patients.

Dr. H. V. Lewis has opened a pet clinic in Davenport, Ia., where "anything from a manicure to an appendectomy may be had for anything from a snake to a panda."

Dr. H. R. Houghton has opened a modern hospital for small animals in Farmington, Mich. It is completely equipped with every facility for diagnosis and treatment.

Dr. M. J. Dills, Decatur, Ill., is building the most modern and complete animal hospital in central Illinois. It will be ready for occupancy March 1st.

Dr. R. E. Glew has erected a new hospital and kennels at Oelwein, Ia., which is "built for sanitation, not for beauty" and is "one of the neatest and most sanitary places of its kind in the state."

Drs. H. J. and M. G. Magrane, Mishawaka, Ind., have opened an animal hospital "almost as complete in scientific detail as modern hospitals for humans." A number of exterior and interior views of the hospital are given which amply support the statements as to facilities and equipment.

Dr. D. E. Buckingham, Washington, D. C., states that 70% of the urban and 40% of the rural dogs now receive adequate medical services in the hundreds of veterinary hospitals in the country; that two billion dollars is spent yearly for medical service, food and other supplies for dogs. Since he estimates (guesses) the number of dogs to be 16 million, that is $125 apiece, including even the 30% of city dogs and the 60% of farm dogs that are strays or not coddled by their owners.

Dr. R. A. Self, Dallas, Tex., has opened the most elaborate pet hospital in the state. A full page in the rotogravure section of the Sunday edition is given over to views of the hospital and crowds attending the formal opening.

Litigation

Dr. W. A. Bunnell, Cleves, O., was awarded damages for the loss of seven sheep and one goat alleged killed by dogs in 1937. Doctor Bunnell appealed from an adverse finding of the Board of County Commissioners and the courts took three years to find in his favor.

A $3,000 award to Dr. W. F. Lee, Rochester, Minn., for injuries sustained from the kick of a horse, was reversed in the Minnesota Supreme Court on the grounds that the fact that the horse was nervous and kicked while being examined in the sales ring did not warrant the jury in finding that the animal was vicious, or that the owner of the horse was guilty of any negligence in connection with the veterinarian's injury.

Disease Outbreaks

Dr. K. W. Stouder, Ames, Ia., estimates that 10% to 20% of the loss of Iowa hogs from disease is due to swine erysipelas.

Mr. C. C. Collet, Lake Charles, La., County Agent, states there is hog cholera in the parish and counsels all farmers who note anything wrong with their hogs to consult him.

Dr. W. L. Collins, Windsor, N. C., "government veterinarian," will be in Gates County

each Wednesday to visit farms which have sick hogs on them. He specializes in hogs and will not treat other live stock.

Dr. L. H. Moe, Oklahoma A. & M. College, Stillwater, states that hog cholera is more prevalent in southeast Oklahoma than at any time in recent years. Many cases are complicated with swine erysipelas.

Mr. A. B. Ford, Nacodoches, Tex., County Agent, warns live stock owners to keep a close watch on their cattle for signs of a new and dreaded disease, known as hemorrhagic septicemia, a large number of cattle having already died of it. "The symptoms include a feverish and droopy appearance accompanied by staggering. Little can be done to cure it, but vaccinations are effective in preventing it."

The Rabies Problem

Dr. J. M. Sutton, state veterinarian, "has clamped quarantines against free-running dogs in southeast Georgia." Dr. T. F. Sellers, of the public health department, said that of 250 fox heads examined since this outbreak of rabies began, 90 were positive for rabies.

Dr. J. A. Summers, director of the Pulaski County health unit, has announced a "90-day quarantine on unmuzzled dogs running at large within an area east of North Little Rock, Ark., within two miles south, three miles south and east, and one mile west of Warden's filling station at Rose City." Doctor Summers said a rabid dog bit several other dogs recently in the Rose City vicinity.

Seven persons at Wilmington, Ohio, are taking the Pasteur treatment "as a result of a mad dog scare. The scare is believed to have started with a pet dog of Russell Faris, which never has been captured or killed."

"At a special meeting of the Pineville (W. Va.) town council orders were given to town officers to impound all dogs and shoot all cats caught running loose. Citizens are asked to keep their live stock under close supervision as numerous reports have been received of animals dying of rabies."

Game Warden D. F. Richardson states that "a very serious situation" prevails in Orangeburg County, S. C., as a result of rabies in foxes; two cows, a calf, three pigs, a mule and three persons having been bitten. Fourteen foxes believed to have been rabid have been killed and 12 found dead.

Dr. Porter Caughman, Columbia, S. C., defended prophylactic vaccination of dogs as insurance against rabies in a vocational address at a luncheon of the Rotary Club. "Vaccination is not perfect by any means, but there is not the least doubt in my mind but that it is very effective if properly administered."

Dr. T. H. West, director, southeastern (Georgia) health district, reports 14 cases of antirabies vaccine having been administered to persons in the county after they were bitten by pets which had hydrophobia. In view of "the alarming number of rabid animals in the county, it is difficult to understand why more dogs are not vaccinated, when at so small a cost the lives of the owners and others might not be put in jeopardy from the dread disease."

Cattle Reduction Plan?

The test-and-slaughter Bang's disease project was first promulgated as a cattle reduction measure in 1934. It didn't work. Dr. W. H. Lytle, state veterinarian of Oregon, points out that Oregon, Virginia and Washington, the three states that lead in the project, also lead in cattle increase since 1934, with 110%, 107%, and 116% increases respectively.

* * * *

Vaccination for Brucellosis Enthusiastically Received

No announcement concerning veterinary medicine or animal disease control, since the last outbreak of foot-and-mouth disease, has received as much newspaper publicity as Chief Mohler's recommendation of the use of vaccination in the control of brucellosis in cattle. So far as is known, every farm paper and magazine, every weekly newspaper and most daily newspapers noted it.

White Snakeroot Poisoning in Arkansas[1]

By E. L. NIELSEN and D. F. EVELETH,[2]
University of Arkansas, Fayetteville, Arkansas

POISONING from white snakeroot, *Eupatorium urticaefolium* Reich., generally referred to as "milk sickness," has been reported previously from northeastern and eastern United States.[3, 4, 5] Reports citing the geographical distribution of white snakeroot and its manifestations of poisoning in animals and humans, are given in the extensive bibliographies of the cited papers. Although medical practitioners have treated a number of cases of human milk-poisoning near Harrison and Jasper, Arkansas, during the last 40 years, the cause of this poisoning had not been recognized until recently. The Arkansas localities mentioned are at least 300 miles west of central Tennessee and 200 miles southwest of points in Missouri and Illinois, the nearest points to Arkansas from which this sickness has been reported. The present paper purports only to record the incidence of this illness for the Arkansas localities mentioned, and certain relevant observations and experiences. These were gathered in the region about Ponca and Compton. These hamlets are situated in northwestern Newton County, Arkansas. Topographically, they are situated in a region "cut by many narrow, canyon-like valleys, but back from the larger streams the surface is much less dissected, and is gently rolling."[6] The thin mantle of soil that overlies the outcropping rock formations of the Mississippian and Pennsylvanian age, is of low productivity. The forest of the region is of the "oak-hickory" type, and with it are the usual understory herbs and shrubs. This type of topography and vegetation occurs over a large area of the Ozarks. Improved pastures are uncommon and cattle are left to maintain themselves by "open range" grazing. Mr. Thomas Silvey, the Newton County Agricultural Agent, estimates that 90% of the "pasturage" in his county is of this type. Throughout this region colonies and individual plants of *Eupatorium urticaefolium* are abundant. The herbaceous understory vegetation here is frequently represented by as many as 10 colonies or individual plants of the weed in an area of 25 square feet. In more open situations the density of growth is usually somewhat less, but the weed is everywhere abundant. It was reported to the writers by Mr. Silvey and by Lee Railsback, D.V.M., that in certain localities, not visited by the writers because of their inaccessibility, the hillsides are sometimes completely white and "looked as though they were snow-covered at flowering time." It was from this region that Mr. Silvey first submitted a plant specimen for identification in an effort to ascertain the source of trouble and to secure recommendations toward its rectification.

The usual symptoms of the disease in man and animals seemed to prevail. The manifestations agree very well with those described by Couch.[4] Attending physicians and those who had recovered from the disease reported weakness, dizziness, loss of appetite and nausea as the preliminary symptoms. Vomiting was common. Some reported a slight rise in temperature with severe dehydration. A persistent thirst was a common complaint. Weakness and muscle soreness were reported by one woman who had survived an attack of milk sickness. All reported slow recoveries with frequent relapses.

In animals, especially cows, the usual report was that the animals refused to eat and could stand only with difficulty. When these cows were forced to move they frequently staggered and often fell. Trembling was reported in most descriptions of the sick cattle. Couch [4] refers to the acetonemia

---

[1] Research Paper No. 688, Journal Series, University of Arkansas. Published with the approval of the Director of the Arkansas Agricultural Experiment Station.

[2] Departments of Agronomy, and of Bacteriology and Veterinary Science, respectively.

[3] Wolf, F. A., R. S. Curtis and B. F. Kaupp, 1918. A monograph on trembles or milksickness and white snakeroot. *N. C. Agric. Exp. Sta. Tech. Bull.* 15.

[4] Couch, J. F., 1933. Trembles (or milk sickness). *U. S. D. A. Circ.* 306.

[5] Muenscher, W. C., 1939. *Poisonous Plants of the United States.*

[6] Croneis, C., 1930. *Geology of the Arkansas Paleozoic Area.*

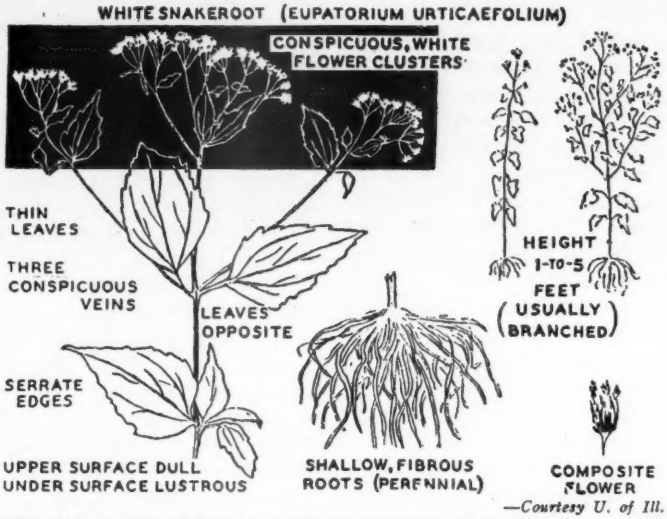
which is a very common finding in most cases of white snakeroot poisoning. Acetonemia in cattle is quite common in many parts of the Ozark area but just how much is due to white snakeroot poisoning cannot be stated. In discussing the problem with the inhabitants of the region they reported that they frequently did not observe symptoms in the milk cows until after they themselves were suffering from milk sickness.

There were several pertinent statements made that indicate the importance of the toxicity of this weed in the Ozarks. A local physician reported through Mr. Silvey that during his period of practice in that region he has known of "probably 25 human deaths caused by milk sickness."

The following incident was told to Doctor Railsback of Harrison, Arkansas, by some of his clients who had lived in that region for many years: "They related that in one instance they had seen two dead people in one room and five more sick who looked like they would die any minute. However, the remaining five survived. . . . This same couple told of having six sick calves and one sick cow at one time, one dry fall. Only one calf survived. This calf was put on wheat pasture and kept there without water. . . ."

The usual superstitions prevail as to the cause of milk sickness in this area: fog settling on herbage, fog blowing out of the valleys, and minerals present in water. One family reported that they contracted milk sickness from flies and another from a heavy infestation of fleas. Another family refused to eat locally grown vegetables or to drink milk drawn from cows ranged in this area. Here milk sickness always occurs during the late fall drought period when animals have a limited supply of desirable herbage available for consumption. It is reported that animals will not graze white snakeroot if other feed is available. It was therefore recommended that additional roughage be fed and that more improved pastures be established, whereupon mowing for weed control might be practiced and consequently limit the possibility of snakeroot consumption.

The writers wish to thank Mr. Silvey and Dr. Lee Railsback for aid and information.



—Courtesy U. of Ill. Agr. Exp. Sta.

White snakeroot *(Eupatorium urticaefolium)* is a slender, erect perennial herb which grows from one to five feet high. In the late summer the small white flowers appear as compound clusters, having eight to 30 flowers. The roots are coarsely fibrous and usually shallow. White snake root poisoning, milk sickness, was responsible for many deaths among the early settlers of Ohio, Indiana and Illinois, including that of the mother of Abraham Lincoln. Its cause was not understood in those days and it was frequently diagnosed as typhoid fever, malarial fever, ague, etc. The plant still grows in woodland pastures in those states and is responsible for occasional deaths of animals from tremetol poisoning during dry seasons

Treatment of Mange in the Horse

The Demianovich method of treating mange [see VETERINARY MEDICINE, November, 1939, p. 682; November, 1940, p. 666] was adopted in two cases of mange at a military veterinary hospital.

Briefly, the treatment consists of an application of a 60% solution of sodium hyposulphite, which is allowed to dry on the coat and skin. This is followed by a dressing of a 10% solution of commercial hydrochloric acid. The chemical reaction between the hyposulphite and acid results in the formation of sulphur dioxide, sulphur, salt and water, the first two of these having acaricide action on the mange parasite.

Case No. 1 (Psoroptic Mange).—This horse was admitted to hospital December 6, 1939, suffering from strangles. A week later a bare patch developed on the neck, showing pruritus. Examination of a skin scraping revealed *Psoroptes communis equi.* The case was dressed with the above-mentioned solutions of hyposulphite and acid. The solution of hyposulphite was scrubbed into the coat with a body brush, allowed to dry and then the acid solution was applied in a similar manner.

The white deposit of sodium hyposulphite on the coat and skin was very evident and the subsequent application of the solution of hydrochloric acid resulted in a distinctly noticeable odor of sulphur dioxide.

Although the weather was bitterly cold, the horse showed no ill effects, being well blanketed and exercised until dry. The dressings were applied three times at intervals of three days, and then grooming was continued. The pruritus continued for a few days, gradually subsiding.

Several skin scrapings were taken, but examination failed to reveal the parasite, and the horse was discharged as cured.

Case No. 2 (Sarcoptic Mange).—This horse was admitted to hospital November 17, 1939, with a severely contused wound. On December 11th it was found to be extremely itchy on the near quarter.

Examination of skin scrapings revealed the presence of *Sarcoptes scabei,* var. *equi,* in considerable numbers. This case was given a course of treatment similar to that administered to Case No. 1.

At the end of the three successive dressings, scrapings from the lesions made on several occasions failed to reveal the presence of the parasites. The pruritus continued over the local lesion and the dressing was repeated over the quarter only. Later, as the skin over the local lesion was rather dry and hard, a dressing of sulphur ointment was applied. The horse was discharged cured on January 19th.

Several cases of loss of hair and pruritus, in which no parasites were found, have been treated by this method, with beneficial results. It has been found that this method of treatment is clean to use, simple and quick in application.

It requires about 20 to 30 minutes to dress a horse all over with each solution, and in damp, cold weather it takes about one hour before the animal is dry. In the very cold weather the dressing of some horses was spread over two days. On the first day the head, neck and fore quarters were dressed and on the following day the remainder of the body.

As judged by the limited number of cases on which this form of treatment has been tried, it appears to be useful and efficient, and well worth a more extended trial in the treatment of mange and other skin diseases.—*Jnl. Royal Army Veterinary Corps* 11:3.

Control of Shipping Fever

In some cases of atypical hemorrhagic septicemia it is necessary to prepare an autogenous bacterin before satisfactory results are obtained. The establishment of a substantial immunity against an extremely virulent infection requires the administration of at least two and preferably three doses of bacterin at five-day intervals. By the time the third dose is administered, improvement is usually noticed. Two doses are ordinarily sufficient, but should not be depended upon to control the disease. Antihemorrhagic septicemia serum and sulfanilamide are recommended treatment for affected animals. Camphor in oil may be administered to advantage.—*A. T. K.*

Recent Materia Medica

VIII. Vitamin B Complex

By PROF. VICTOR LEWITUS
Nutley, New Jersey

IN THE FIELD of vitamin research, the vitamin B complex still remains a challenge to the modern scientist, this in spite of the fact that within the last year or so two additional members of the group have yielded their identity and have been synthesized. The fact that we still use the term "complex" is sufficient evidence that a number of factors are still to be determined. The ramifications of this heterogeneous group of substances are so widespread in their influence on animal metabolism that few recognize its importance. It should be pointed out at the outset that even though the several factors within the group occur together, their chemical and physiologic relationships are often entirely unrelated—a fact which is contrary to popular understanding.

It has already been hinted (see article on riboflavin in the September, 1940, issue of VETERINARY MEDICINE) that an undue amount of confusion has crept into the literature pertaining to certain members of the vitamin B complex. That this should be so is not surprising, for various workers have, at least during the earlier phases of the work, considered observed reactions to be due to a single entity when, in fact, they had been dealing with a conglomeration of a number of vitamins existing in a common source.

The resumé of vitamin B_1 (now officially termed thiamin hydrochloride), vitamin B_2 or G (riboflavin), and nicotinic acid, all members of the B-complex group, have already been presented (*Vet. Med.* August, September, 1940, February, 1941). Discussion of several other important members of the B complex still remains, and an attempt at summarizing our present knowledge will be made.

At present, the components that have been identified as part of the B complex are vitamin B_1 (thiamin), vitamin B_2 or G (riboflavin), vitamin B_6 (adermin), nicotinic acid (P-P factor), pantothenic acid (filtrate factor), vitamins B_3, B_4, B_5, and factor W. There is also a gray-hair preventive factor (Lunde and Kringstad) of which not too many facts are known. Vitamin B_1, vitamin B_2 or G, nicotinic acid, vitamin B_6, and pantothenic acid have been definitely isolated and synthesized, the last two having been synthesized only within the past year. The remaining factors, several of which have been determined by György, have only a meager background to support them. Other fractions have been reported, but those mentioned have received most attention in scientific literature.

CLASSIFICATION OF ELEMENTS IN VITAMIN B COMPLEX

Thermolabile Factors	*Unclassified Factors**	*Thermostable Factors*
Vitamin B_1	Antianemic factor	Vitamin B_2(G) (riboflavin)
Vitamin B_3	Vitamin H	Nicotinic Acid
Vitamin B_4	Extrinsic factor	Vitamin B_6
Factor W	Choline	Vitamin B_5
Anti-Gizzard Erosion factor [?]		Pantothenic Acid (Filtrate factor)
		Gray-hair Preventive Factor [?]

Those factors of which the properties are better known, will be discussed, the thermostable group being considered first and the thermolabile factors second.

Vitamin B_6 (Adermin)

Vitamin B_6, officially known as pyridoxine or pyridoxine hydrochloride, has the formula $C_8H_{11}NO_3HC1$ and is chemically 2-methyl-3-hydroxy-4,5 (dihydroxymethyl) pyridine. It was first established as a component of the B complex by György in 1935; was isolated from natural sources by Keresztesy and Stevens, Lepkovsky, Kuhn and Wendt, and also by György in 1938; and was ultimately synthesized by Harris and Folkers, and also Kuhn and others, in 1939. Vitamin B_6 is standardized by means of rat assays. Two-day-old rats are placed on B-complex-free diets (except for thiamin and riboflavin), and permitted to de-

*These factors appear to be associated with the B-complex group but must be accepted only tentatively as such.

velop B_6 deficiency within five to eight weeks. The symptoms include swollen or edematous paws, thickened and at times encrusted ears, denuded nose, and occasionally ulcerated tongue and mouth. Once these symptoms are well enough advanced, the test substance is administered in a single dose orally; and the effect noted for a period of two weeks, careful record of the weight being kept, since B_6 causes a significant though transient gain in deficient animals. It has been found that the synthetic pyridoxine is just as effective as the natural product in relieving these disturbing symptoms. It has been found, according to Reedman, Sampson, and Unna, that 50 micrograms is sufficient material to cure severe symptoms in 70% to 80% of the animals within the two-week period. Ten micrograms are found to bring about normal growth. Vitamin B_6 consists of a white crystalline powder, readily soluble in water, slightly so in alcohol, and insoluble in ether. It is stable to light, heat, and air. Aside from the synthesized material, the most potent sources are vegetable oils, egg yolk, liver, and yeast. The vitamin melts at 160°C.

One of the most interesting developments in the chemistry of vitamin B_6 is the discovery that pyridoxine is a derivative of pyridine, which is also the fundamental ring structure for nicotinic acid. The pyridine structure seems to be concerned with biologic oxidative — reduction reactions; and Birch has suggested recently that vitamin B_6 is in some way associated with the utilization of unsaturated fatty acids.

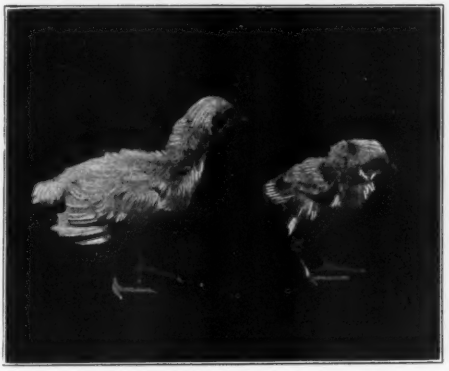
The effects on rats in producing the typical severe form of dermatitis known as rat acrodynia have already been described, since this condition serves as an assay method for determining potencies. However, there are also retardation of growth, muscular incoördination, edema, and microcytic anemia in milder types of the deficiency; dermatitis, various types of lesions such as ulceration of the mouth, ears, paws; "rat pellagra," ophthalmia, acrodynia, abscesses, and diarrhea under more severe deficiency states. In dogs suffering B-deficiencies it has been shown that vitamin B_6 restores the temperature to normal and there is a concomitant augmentation of the growth and weight curves. Recently, Fouts, Helmer and Lepkovsky found that in dogs nutritional microcytic hypochromic anemia could be cured with vitamin B_6. Puppies maintained on a casein diet deficient in this factor, failed to grow and exhibited (in three of four cases) generalized convulsions. In all cases the anemia was cured, but in one dog convulsions persisted. Chick and others have reported similar findings in pigs suffering from a deficiency which responded to feeding of liver eluate. Growth was resumed, anemia cured, and convulsions in the pigs disappeared. In the work with anemic dogs, copper and iron seemed without effect, whereas intravenous injection or addition to the diet of vitamin B_6 effected the cure. According to Norris, vitamin B_6 is essential to chickens, a lack of the vitamin resulting in an abnormal, jerky gait. Jukes at the University of California has studied this type of deficiency in poultry. Failure of growth and convulsive movements are the most prominent symptoms, even though blood counts appear to be normal. Elvehjem found that 300 gamma, and Hogan 400 gamma, per 100gm of ration support normal growth of chicks; and the former authority states that 300 gamma per 100gm of synthetic ration is sufficient for the dog. Spies, Bean and Ashe described a syndrome in man characterized by extreme nervousness, insomnia, irritability, abdominal pain, weakness, and difficulty in walking. These disturbing symptoms disappeared dramatically following the intravenous administration of 50mg of synthetic vitamin B_6. Spies, Ladisch and Bean have since studied additional cases showing residual symptoms of nutritional deficiency which were not relieved by nicotinic acid, thiamin, or riboflavin. These workers studied the urinary excretion levels and found those having distinct B_6 deficiency symptoms showed the lowest excretion (only about 0.2%). The B_6 administered was quickly absorbed, and almost none was excreted. These findings indicate the importance of B_6 to humans, and that nutritional diseases often occur as a complex. Vilter has shown that 50 to 100mg of vitamin B_6 has a positive effect on

the hemopoietic system in man also. Within 48 hours strength was noticeably improved. Jolliffe treated three cases of paralysis agitans (Parkinsonism) with the vitamin, and obtained immediate and marked improvement. Rigidity and trembling vanished within two weeks after giving the vitamin. Spies and Bean also report improvement in this condition. They find best results in the postencephalitic cases. Even a few minutes after injection, tremor and rigidity are decreased and the patients walk without their customary stiffness. Supplee, Bender and Kahlenberg have attempted to show that an additional factor besides vitamin B_6 is necessary for complete response to be obtained from the vitamin. In other words, complementing factors appear to be required for the full effects. Little is known of the vitamin B_6 requirements of domestic animals but this does not justify the assumption that it is not important in the nutrition of such animals or that they may not suffer from lack of it.

Toxicology.—Unna and Antopol have reported their findings as regards the toxic influence of vitamin B_6 in the case of rats, dogs and monkeys. In rats, a dose of 1 gamma per kg produced no toxic signs. Higher dosage produced tonic convulsions, the hind limbs stretched outward, fore limbs bent under the body with the paws closed. Between convulsive attacks the animals were able to move slowly and awkwardly, indicating interference with the righting reflexes. Sublethal doses caused these symptoms to last as long as three weeks. Lethal doses caused tonic convulsions and death in 36 to 72 hours. The L.D. 50 (dose fatal to 50% of animals) following subcutaneous injection was 3.1 gamma per kg for pyridoxine and 3.7 gamma per kg for pyridoxine hydrochloride. On autopsy, the adrenal cortex showed occasional massive hemorrhages. In dogs, 20mg of B_6 per kg body weight was given orally for 75 days. Weight increase was normal and showed no difference from that of control animals. Blood counts were normal and no pathologic changes were found. In monkeys also toxic symptoms appeared to be absent. The studies indicate that vitamin B_6 is a substance of low toxicity. The vitamin is either rapidly excreted or promptly destroyed when given in excess dosage.

Pantothenic Acid (Filtrate Factor)

Pantothenic acid, so-named by Williams in 1933 because of its universal occurrence



The need of poultry for the vitamin B complex is strikingly illustrated by these two chicks. They are the same age, but the one on the left was receiving an adequate diet, while the one on the right was fed a ration lacking in some of the essential B-factors

(after the Greek, meaning "from everywhere") is also known as a result of some early observations as the chick antidermatitis factor. It has recently been synthesized by Stiller and others. Its chemical formula is $C_9H_{17}O_5N$. It consists of a colorless liquid, soluble in water and alcohol, and stable to heat, alkalies, and light. It forms salts which are white, crystalline powders, the calcium salt being $(C_8H_{14}O_5N)_2Ca$. It exists in all living tissue, but is found concentrated in liver, kidney, and also in yeast, as well as in rice hulls and molasses. The exact physiologic significance of this new vitamin has not as yet been definitely ascertained, but there appears to be some distinct relationship between it and the part that riboflavin plays in metabolism. In conditions such as pellagra and ariboflavinosis, observers have reported a distinct decrease in the pantothenic acid content of the blood. Pantothenic acid is also considered to be of value in the matter of growth in animals. Animals which have served in an experimental capacity for studying this vitamin are chickens and

rats. Chickens are known to develop a dermatosis when restricted to a heated ration or when the so-called "filtrate factor" is absent. They are distinctly stunted, the feathers are ruffled, the appearance is generally unthrifty or crippled, and the comb is undeveloped. This condition is not improved by supplementing the ration with nicotinic acid. Upon the addition of pantothenic acid or the calcium salt to the diet, the animals become well developed, grow tall and sturdy-looking, and develop their combs. According to Norris, pantothenic acid is required in poultry for proper growth, viability, and hatchability. Chicks lacking pantothenic acid, develop "granular eyelids, scabby lesions at the corner of the mandibles and around the vent. The feathers are rough . . . and occasionally the skin on the "bottoms" of the feet thickens and hardens and fine cracks appear. Due to degeneration of the nerve tissue of the spinal column, there may be a slight incoördination of gait."

In the case of rats, deficient diets produce a rough coat, sores on the mouth and snout, and poor growth. The paws are often very sore, and dermatitis is in evidence. On proper dietary supplementation, the animal is well developed, has a smooth coat, and shows good growth response. According to Peterson and Hughes, the poultry requirement of pantothenic acid is about 1.4mg per 100 grams of feed. Pearson estimates the figure 3.6mg per pound of feed. Phillips and Engel have noted no lesions in the brain of affected chickens, but degeneration of the fibers was found in all segments of the cord down to the lumbar region. There is, at present, no chemical or physical standard for the substance, but estimations have recently been made on the amount necessary to protect chicks from developing the typical dermatitis when fed a particular diet. It has recently been shown that pantothenic acid is synthesized in the intestinal tract of ruminants, hence is probably not a dietary essential for sheep and cattle. Recent investigations indicate that pantothenic acid is essential to dogs. In its absence, the dog becomes severely constipated and exhibits certain nervous symptoms such as incoordination, smooth-muscle spasms, and generalized convulsions. The animal dies from an anemia unless promptly treated with food containing the vital substance. Studies of pantothenic acid in human nutrition are in progress. The work of Spies and others points to the importance of pantothenic acid in human metabolism. He found that when pellagrins or patients suffering with ariboflavinosis are treated with injections of calcium pantothenate or sodium pantothenate, there is a rise in the blood pantothenic acid and riboflavin levels. Twenty mg of the calcium salt were given. These observations indicate that the vitamin is essential to man and that it is probably associated with riboflavin in some way.

György and Poling have attempted recently to demonstrate the influence of pantothenic acid in cases of nutritional achromotrichia. When rats are maintained on a vitamin B-free diet, supplemented with B_1, B_2, and B_6, depigmentation of the fur with subsequent graying in black animals and "rusting" in albino animals occurs. In these pantothenic-acid deficient animals, gradual doses of pantothenic acid were given. The effect of the pantothenic acid was prompt and definite. Following the administration of 75 to 100 micrograms, the first growth of normally pigmented hair shafts became evident in five to seven days. Smaller doses caused delay in response. Cure of the condition was virtually complete within five to seven weeks. Smaller doses brought incomplete cures only. Hence the authors consider pantothenic acid curative in nutritional graying of the hair of rats.

Whether there exists a separate member of the B-complex which has to do with hair pigmentation is a moot question. It is known that B-complex deficiency in animals other than rats, namely guinea-pigs, dogs, and foxes, has caused definite signs of nutritional achromotrichia. Morgan and Simms have shown recently that multiple deficiency of certain portions of the B-complex leads not only to graying of the hair in rats, but causes more deep-seated effects particularly adreno-cortical, thyroid, and other vital glandular malfunctions. The work of Lunde and Kringstad attempts to

show that there is some other factor in the B-complex than the "filtrate factor" responsible for the anti-graying properties. These workers have shown that the anti-gray-hair principle, which they call vitamin B_x is necessary for the normal development of the pelt of silver foxes.

Vitamin B_5

This vitamin, described by Carter, Kinnersley, and Peters is said to be a heat stable and water soluble factor in yeast which prevents loss of weight in pigeons whose weight has remained stationary on a diet supplemented with vitamin B_1 and B_2. It is also a rat-growth factor.

Vitamin B_3

Another factor, which is heat labile and is derived from yeast or liver or whole grains, is said to promote the growth of pigeons. It is thought by some to be identical with the anti-gizzard erosion factor. It is destroyed at 60°C.

Vitamin B_4

This vitamin, first described by Reader, is obtained from liver and yeast. It prevents nutritional paralysis in rats and chickens. The cerebellum appears to be involved in deficiency. Kline, Elvehjem, and Hart reported production of typical deficiency signs in rats. The animals were inactive, sat in extremely hunched position, and retained a "humped-back" posture on walking. There is disagreement as to the existence of this vitamin.

Factor W

Lack of growth and general emaciation in rats appears to be the only effect of this vitamin so far reported. Elvehjem, Koehn, and Oleson have presented evidence which they consider positive, but others have disagreed with their findings.

Anti-Erosion Factor

According to the work of Almquist, Jukes, and Newlon gizzard erosion has been encountered in commercial poultry investigations. This pathologic condition is erroneously referred to at times as ulceration. The condition consists of rough, frayed areas of the yellow gizzard lining, and at times the yellow tissue may be entirely absent. The color of the eroded areas may be either brown or black; and the pathologic state may be found anywhere along the lining but most often at the cardiac or forward end of the gizzard. The tissue beneath the eroded region may also be involved.

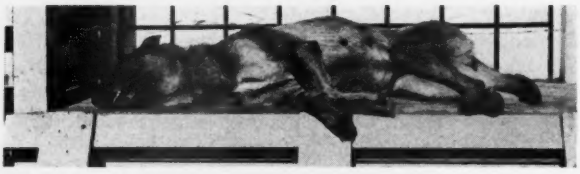
Gizzard erosion has been definitely ascribed to a dietary deficiency, since it has been found that bran, fresh or dried greens, and hempseed or soybean meal have served as prophylactic agents. Rations containing 5% dried alfalfa and 15% wheat bran prevent erosion in most young chicks. Kale appears to contain more of the anti-erosion factor than alfalfa. Agents such as granite grit that influence the blood supply to the gizzard by increasing its activity also reduce the incidence of the disease. Although fungous conditions or mycoses have been found concomitantly with the true erosion, the etiology of each condition is entirely different. As chicks become older, it seems that there is less chance of acquiring the disease, it being presumed that there is less need for the factor or factors that serve as preventives. There appears to be no direct connection between gizzard erosion and growth, since animals suffering from the condition gain in weight as rapidly as normal animals. The contrary does not hold, however, for other deficiencies which inhibit growth have been found to increase the severity of the gizzard-erosion symptoms.

Choline

Choline plays a significant part in the nutritional requirements of several animals. Best noted that this factor of the B-complex is a preventive of fatty degeneration of the liver in rats on certain diets, and Griffith and Wade showed that degeneration of the kidneys occurs in rats on choline-deficient diets. Sure, and also McHenry, noted its value in the growth of young rats. In the poultry field, Jukes has shown that choline prevents perosis in turkeys, and Elvehjem has reported a similar function in growing chicks.

It is manifest that much work remains to be done in the study of the complicated vitamin B complex.

Problems of Anesthesia in Small Animals



By H. J. MOSTYN, New York City

PAVLOV and his associates were the first to observe that conditioned salivary reflexes could be modified by alcohol, caffeine, choral hydrate, bromide, etc. Recently (1937) Dworkin, Bourne, and Raginsky have studied in dogs and cats the changes in conditioned alimentary motor responses brought about by alcohol, amytal, nembutal, avertin and paraldehyde. These were effective in weakening the processes of inhibition. Bulbocapnine, carbon dioxide, nitrous oxide, and ethylene were uniformly depressant. Morphine and hyoscine abolished the positive responses, apparently by producing nausea and loss of interest in the food. In another study in the same year these investigators were concerned with the action of several sedative drugs upon a conditioning neurosis in dogs, produced by making conflicting signals indistinguishable to the animal. They found that amytal, nembutal, alcohol, and avertin abolish most of the signs of inhibitory neurosis in dogs. In these neuroses the appearance of nervous collapse is produced. Twenty-four hours after the use of the foregoing, profound inhibition supervenes. Sodium bromide administered daily for 10 successive days produces full recovery. This may be maintained for weeks or months after its administration has been interrupted.

Data Regarding the Anesthetic Action of Several Agents

Cycloprane.—In 1939 the status of cycloprane was reviewed by the Council of Pharmacy and Chemistry of the American Medical Association. The quantity of cycloprane in the inspired air necessary for anesthesia, loss of reflexes, and cessation of respiration has been reported by a number of observers. Robbins set out to determine the blood concentrations necessary to produce these effects. Dogs were used.

REFLEXES	Number of Animals	Average C_3H_6 % in Air	Average C_3H_6 Mg per 100cc Arterial Blood	Average Distribution Ratio
Loss of corneal reflex	9	18.0	13.9	0.490
Abdominal relaxation	16	22.3	16.8	0.492
Loss of wink reflex	14	27.3	20.6	0.500
Costal paralysis	14	33.6	25.5	0.497
Respiratory arrest	10	35.8	28.2	0.492

As would be expected from a comparison of the distribution ratios of ether and cycloprane, the latter is eliminated from the tissues far more rapidly.

Chloralose.—Dogs were anesthetized with chloralose by Binet and Strumza (1937) and then subjected to various low oxygen tensions in the air breathed. The variations of resistance to the anoxia encountered are directly related to the degree of anesthesia in the animal. A deep anesthesia carries with it a particular vulnerability The nearer the animal approaches awakening, the more its resistance to anoxia increases. Binet and Strumza (1937, 1938) state that as a result of their studies they have come to the conclusion that deep anesthesia produces in the organism a particular sensitivity to diminution of oxygen tension in the inspired air. They used 110 dogs under chloralose. Dogs appear to be considerably tougher than men in withstanding low oxygen tension. Not only the tension at which failure of the respiration occurs, but also the length of time a given tension can be withstood, is important. These investigators found that resistance increases as the anesthesia lightens. An abrupt increase in resistance occurs only

when most of the chloralose has been eliminated. They attempted to control vagal and carotid sinus effects and conclude that

general anesthesia (chloralose) has a direct action upon the respiratory center; the deeper the anesthesia, the more easily anoxia precipitates respiratory failure.

Barbiturates.—Burstein (1937) reports that the closure of the glottis following the intravenous administration of several short-acting barbiturates (sodium thioethamyl, evipal, amytal, nembutal, pentothal) in cats is due to stimulation of the parasympathetic division of the autonomic nervous system.

The injections of the agents were made under standard conditions. When most of the cats coughed, sneezed or hiccoughed during the course of the anesthesia, cyanosis and dyspnea quickly followed. Inspection of the glottis showed spastic adduction of the vocal cords. Atropin (3 to 5mg per kilogram body weight intravenously) always caused immediate relaxation of the cords, normal respiration, and a shortening of anesthesia time. When obstruction of the airway occurs during barbiturate anesthesia, of most importance is the immediate introduction of an intratracheal tube and the provision of adequate oxygen.

Weese (1939) has studied experimentally the role of the carotid sinus in the mechanism of anesthesia accidents in sublingual phlegmons. When, for example, evipal was administered to a dog having a characteristic abscess, no untoward event occurred provided the abscess was undisturbed. Subsequently, when a dog with a sublingual abscess had received one-half the lethal dose of evipal and light pressure was applied to the abscess immediately after the injection, respiratory failure developed at once. Neither prolonged artificial respiration nor analeptics counteracted this failure. In later experiments, when pressure was applied to the abscess five minutes after the injection of an almost lethal does of evipal, the course was normal. In another experiment a dog was given evipal at the rate of 60 mg per kilogram of body weight. Pressure on the carotid sinus on the healthy side barely influenced the respiratory rate; but pressure on the abscessed side led to a reflex stoppage of respiration. The healthy side was pressed again, and no respiratory effect was observed. Four minutes after the injection of evipal, pressure on the abscessed side was followed by only a slight respiratory effect. Evidence is offered that the effects observed are not due to a pain reaction. The anesthesia of the carotid sinus seems to lag behind the anesthesia of the central nervous system. Ether anesthesia depresses the vagus system much more than the barbiturates. Probably this explains why in sublingual phlegmons accidents are more common under barbiturate anesthesia than under ether. However, if intravenous evipal is used, anesthesia deep enough to paralyze the vagus completely must be employed, and the operation should not begin until at

least five minutes after the injection so that the vegetative nervous system is certainly anesthetized.

Gruber (1937) first drew attention to changes produced by the thiobarbiturates in the electrocardiograms of dogs. He found that the first injection of pentothal produced disturbances in the electrocardiogram in most cases in dogs and that the second injection was always followed by disturbances such as alternate ventricular rhythm, premature contractions, and shortened P-R intervals. Similar observations were made in cats and monkeys. Morphine enhanced the appearance of these disturbances, while atropine was without effect. Epinephrine removed them temporarily or permanently.

Hafkesbring and MacCalmont (1938) object that they have been unable to find any work in which the effects of the barbiturates upon the electrocardiograms were not masked by the use of other anesthetics; accordingly they have studied the electrocardiograms of dogs and cats before, during, and after the administration of the drugs in an attempt to determine the effect upon the myocardium during anesthesia, the degree to which the electrocardiogram returned to normal with the animal's recovery, and the presence or absence of cumulative effects. Holman and Page (1938) have studied the cardiac output in arterial hypertension (produced by constricting the renal arteries) in unanesthetized as well as in dogs anesthetized with pentobarbital. They found that the cardiac output was not changed by the development of hypertension. The high blood pressure could, it seems, have arisen only through the mechanism of increased peripheral resistance. Light pentobarbital anesthesia did not change the cardiac output of either normal or hypertensive dogs; but when the anesthesia was deep enough to depress the respiration, the pulse rate increased as did the cardiac output. Insufficient data to establish this are presented. It is recorded that marked cyanosis was present under deep anesthesia, and the inference is drawn that the anoxemia is responsible for the increased cardiac output. It is regrettable that these observations were complicated by anoxia.

Blood Changes During Anesthesia

Blitstein (1937) has made a very long study of physicochemical alterations of the blood after surgical interventions under various anesthetics. It is difficult to evaluate such blood changes when the setup is complicated by surgery. This does not imply that such studies are valueless, but that it is dangerous to draw inferences as to the role of the anesthetic from such studies. Many circumstances can effect rather wide variations in the concentration of the several elements in the blood. Bollman, Svirbely, and Mann (1938) point out that the rapidity of the variations in plasma volume caused by withdrawal of water from the tissues to the blood or the loss of fluid from the blood to the tissues is generally appreciated. They have considered experimentally the influence of ether and amytal anesthesia upon blood concentration in dogs.

Light amytal anesthesia usually produced a definite reduction in the hematocrit value. Typically there was a definite increase in the plasma volume. These changes were of the same relative magnitude, so that the total circulatory blood volume appeared only slightly changed.

Light ether anesthesia of normal dogs resulted in an increase in the hematocrit value and a decrease in total plasma volume. There was little if any net change in blood volume.

Hamlin and Gregersen (1939) report that the intravenous injection of nembutal to produce anesthesia causes a 10% increase in plasma volume in normal cats.

Dallemagne (1938) continues to state that evipal anesthesia may be followed by a grave degree of anemia. Beecher (1938) was, however, unable to confirm this observation and found, on the contrary, that even when a more intensive and more prolonged exposure to evipal was carried out than that employed by Dallemagne, detailed studies of the erythrocyte count, the cell volume, the mean corpuscular volume, the hemoglobin, and the oxygen capacity all failed to show any anemia-producing effects of evipal.

I. A. Lerman (1936) has studied the influence of sodium barbital, chloroform, and ether upon glycemia in dogs. The barbital was administered by mouth. The rate of

absorption is too uncertain by this method for use in such a study as this.

This hospital scene of 25-odd years ago represents what was then a new departure in animal anesthesia—nitrous-oxide-oxygen anesthesia. The method was described enthusiastically and in detail by George W. Little, then Chief Surgeon for the S.P.C.A., New York City, in the February, 1917, issue of *Veterinary Medicine*

Defandorf (1938) reports that the administration of anesthetic doses of paraldehyde to healthy, fasting dogs produced a small elevation of the blood sugar level. This was greatest during the first hour and averaged 16mg per cent. High elevations of blood sugar occurred in poorly nourished animals under paraldehyde anesthesia. Glycosuria did not occur in normal dogs during paraldehyde anesthesia. Significant quantitative changes in the rate of urine secretion were not observed.

Bowman and Muntwyler (1935) have found that the urinary secretion of ascorbic acid in the dog following ether anesthesia is increased ten to fifteenfold.

Gastrointestinal Changes

Oettel (1935) has made the following observations on the influence of anesthesia and laparotomy on the motility of the small intestines. In the normal small intestine of the dog it was shown that under general anesthesia (chloroform, ether, evipan, pernocton, chloralose, avertin, urethane, paraldehyde, chloretone) the intestines are also anesthetized (paralysis of tonus until a resting position in "diastole" is assured).

Acetylene does not paralyze the intestine of the fistulous dog; even in deep acetylene

anesthesia, the intestines go on working normally.

Morphine, in unanesthetized fistulous dogs, in contrast to the true anesthetics, never causes a paralysis of tonus, even in stupefying doses (about 5mg per kilogram body weight), but always an increase in tonus until a spasm lasting for hours occurs.

The movements of the intestine registered under anesthesia after opening the abdominal cavity and cutting the intestine are distinguishable qualitatively and quantitatively from the normal intestinal activity. As a paralysis of the intestine appears after laparotomy even under acetylene anesthesia, the injury to the intestinal motility is dependent upon the operative interference. The small intestine, entirely paralyzed by anesthesia and operation, regains its ability of rhythmic movement by subcutaneous injection of morphine. In a laparotomy under morphine anesthesia, movements of the intestines can be registered accordingly, which corresponds in their main type to the normal activity of the intestine, but are characterized by gradual increase of tonus (typical effect of morphine).

Cyclopropane anesthesia produces a decrease in intestinal tonus and inhibits all types of movements in unpremedicated dogs. In deep anesthesia the inhibition is complete. When premedication with morphine and scopolamine has been used, cyclopropane anesthesia does not lower the high tonus of the bowel, but it partially inhibits nonpropulsive movements. Propulsive movements are absent. The termination of cyclopropane anesthesia is followed by an immediate return of the nonpropulsive movements to the preanesthetic level. Recovery of tonus is rapid, while recovery of propulsive movements may occur at once or require several hours.

Sleeth and Van Liere (1938) have carried out in dogs a comparative study of the effects of various anesthetic agents upon the emptying time of the stomach. Using a standard barium meal and making observations with the fluoroscope, they found under all agents a prolongation of the emptying time: chloroform by 64%, ether by 40%, and ethylene, cyclopropane, and divinyl ether by about 7%. This paper contains some indication of the probable reasons for the more frequent postoperative gastrointestinal disturbances following ether, for example, than following cyclopropane or ethylene.

Hepatic Damage

In any determination of the effects of anesthesia upon hepatic function a number of considerations are inescapable. Is the liver damaged by the operative intervention? The operative factor can be controlled with some degree of completeness by a large series of similar cases under various anesthetic agents. Considerable doubt can be raised as to whether measurement of one of the liver's functions gives a useful picture of damage produced by the anesthetic agent. It must be borne in mind that whatever the anesthetic, the longer the duration of use, and the older the patient, the greater the chance of hepatic damage.

An interesting historical review of the relationship of anesthetic agents to liver function is presented by Bourne (1936). His concluding remarks are of interest here: "It can be said that, with the exception of cyclopropane, all anesthetics may cause some impairment of liver function. But this should not be taken too seriously, except in the case of chloroform. . . ." The protective action of adequate oxygen is well established. Oxygen shortage may cause irreparable liver damage.

After a study of the effects of divinyl ether anesthesia in dogs, Bourne and Raginsky (1935) conclude that the agent does not alter liver function appreciably in dogs that are normal, unless the anesthesia is accompanied by anoxia, in which case liver damage occurs. They found divinyl ether to be an unsatisfactory anesthetic agent for use with dogs. The animals were too often either about to awake or about to die. The safe anesthesia zone appeared to be narrow—narrower than for man, they conclude.

Radvin (1939), in summarizing earlier work by himself and his associates, says

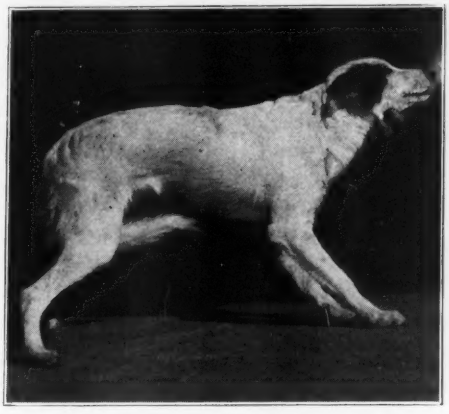
that adequate oxygen in the inspired air during anesthesia will have almost as much protective action on the liver as a high carbohydrate intake.

Continuing on the same theme, it is interesting to find that Cutler (1932), while not able to demonstrate any consistent differences in the amount of liver damage produced by carbon tetrachloride in dogs on various diets, was able to show that the severity of the symptoms and the number of deaths secondary to liver damage could be affected profoundly by the diet, a high calcium diet affording considerable protection.

Widmark (1939) found that the ethyl alcohol level of the blood of fasting dogs was lower than it otherwise was when the fasting animals received various amino acids with the alcohol, by mouth. He also observed a similar effect when proteins or certain acids were given with the alcohol; water, fat and carbohydrate were ineffective.

Blackberg and Hrubetz (1937) report that fasting for 24 hours increases the susceptibility of dogs to pentothal. The duration of the anesthesia is lengthened. No correlation was found between the blood sugar level and the susceptibility to the drug. The year previous (1936) these same investigators found, in a study of the factors which influence pentobarbital (nembutal) anesthesia, that glucose by vein does not shorten the duration of the anesthesia materially, whereas fasting for 24 hours materially increases the period of anesthesia. No correlation between blood sugar levels and susceptibility could be demonstrated. The blood sugar level at the time of greatest depression from the agent continued at the initial level until time of recovery, when a definite drop occurred.

One of the well-known hazards of the use of barbiturates is their variability of action. The factors underlying this variability are not at all clear. It is known that fasting increases susceptibility to barbiturate action. The findings of Blackberg and Hrubetz are of considerable interest. They found that nembutal and amytal produce no change in blood sugar levels at the time of deep anesthesia. Pentothal and seconal bring about a rise in the first hour. In general, the agents produce a significant fall in blood sugar level at the time of recovery from anesthesia. Since lowering of blood sugar levels does not explain the increased drug effects, they investigated liver function and carbohydrate mobilization. The short-acting barbiturates are believed to be largely detoxified in the liver and accordingly might be expected to influence the glycogenolytic function of that organ; however, phenobarbital eliminated by the kidneys likewise depresses liver function. These findings strongly suggest that all barbiturates, however eliminated, produce a transient impairment of liver function.



The needle *in situ* for epidural anesthesia, often used for operations on the anal glands, for castration, and for operations generally on the hind quarters

Renal Function

The effects of the common anesthetic agents on normal kidney function have been studied on several occasions. In this regard, the paper of Orth and Stutzman (1938) is of considerable interest. Since urea is the chief product of excretion in the urine and since both tubules and glomeruli are involved in filtration and reabsorption, urea clearance determination would appear to give an index of the action of anesthetic agents on the kidneys if damage occurs. It is well known that slight fluctuations in clearance values may occur and may represent normal variation in

kidney function. Sixty to 75-minute periods of "surgical" anesthesia with cyclopropane, ether or chloroform were carried out in dogs at about weekly intervals for many weeks. The results indicate that none of the three anesthetic agents studied interferes with kidney function, as determined by urea clearance. Repeated collections of 24-hour samples of urine following each anesthetic agent showed normal volumes. Microscopic examination showed "slight casts, leucocytes, and occasional erythrocytes." A slight albuminuria present after ether cleared within a few days. The authors did not encounter this after cyclopropane or chloroform. They never found glycosuria.

It has been shown by a number of workers that the rate of secretion of the urine is diminished under sodium isoamylethyl barbiturate. It has also been shown that under this agent dilution of the blood occurs. Gouaux and his co-workers (1937) have studied the effect of this anesthetic in 50 dogs, and they find that there is no serious interference with kidney function, as measured by the urea excretion.

Suprarenals

Emerson (1938) reports that there was a significant decrease in the amount of adrenin found in the suprarenals of cats anesthetized with ether for 30 minutes, but this was not so after divinyl ether. The decrease did not occur under ether if barbiturate premedication was used.

An increased outpouring of adrenin during anesthesia may be due to (1) excitement during induction or recovery or (2) continued stimulation of the "sympathetic center" or the splanchnics during deep anesthesia.

Rectal Administration of Anesthetics

There are two main routes of administration for nonvolatile agents for general anesthesia — the veins and the rectum. Some agents, such as avertin, can be introduced only through the rectum. But in the case of the barbiturates, many can be introduced directly into the blood stream. Many writers have recently advocated that the barbiturates be introduced rectally. The recommendations of their writings, however, raise the question of the relative controllability of these two routes of administration.

Several points are pertinent to such a consideration:

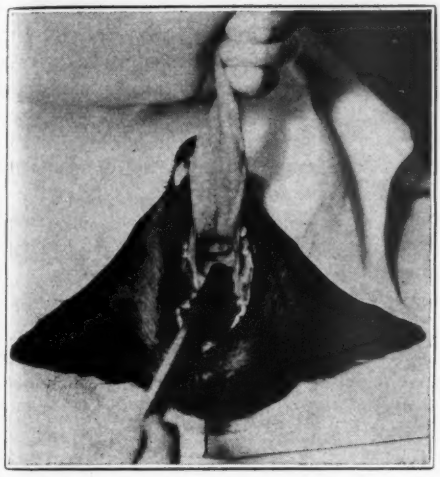
1. Once an agent is placed in the rectum it is nearly impossible to recover it after it begins to exert its normal action or to give toxic effects. While high colonic irrigations may be tried in an endeavor to wash it out, the fact is that such action may sweep the offending agent higher in the bowel and allow even more rapid absorption with greater toxic effects to follow.

2. Even though a solution of given volume may be injected into the rectum at a standard speed, it is impossible to guess to what height it will travel up the bowel. There are several reasons for this. There is no need to point out how uncertain cleansing of the bowel may be as the result of a routine enema. The height to which an anesthetic agent will travel on being placed in the rectum is determined in large part by the fecal content of the bowel. Other factors active in regulating height (and impossible of accurate evaluation) are tone of the bowel, peristalsis, and anatomic anomalies.

3. It is well known that the toxicity of the nonvolatile anesthetic agents depends to a great degree upon their rate of absorption. With some of the agents, as with sodium barbital, while the blood level is rising as a result of absorption, it may be counterbalanced by excretion through the kidneys and a safe blood level may thus be maintained. In other cases, as with the fast-acting barbiturates, a safe blood level depends in great part upon liver destruction concomitant with absorption. An abnormally rapid rise in the absorption rate, however, easily upsets the balance that experience has taught is safe, and serious toxic effects follow. The higher agents travel up the bowel, the more rapidly they will be absorbed.

4. The following statement, then, seems to be a reasonable one. If we cannot efficiently control an agent once it is placed in

the rectum, if we cannot control the height to which a solution injected into the bowel will rise, then it follows that we cannot control the rate of absorption. If an agent can be used intravenously there is no reason to resort to the inaccurate and unsafe rectal route.



The very fast-acting barbiturates are destroyed so rapidly in the body that, if they be used orally or rectally, the time required for absorption delays entry so that relatively large doses must be used. Individual variations in absorption rate render such practices dangerous. So it seems doubtful if the very fast-acting barbiturates can ever be used safely except by vein. The very short-acting barbiturates when used by vein, should, other things being equal, be safer for intravenous use than are the slower-acting ones. This is so because the very fast-acting agents are characterized by rapid induction, a rapid appearance of the maximum effect, and rapid destruction. This permits a more precise control than is obtained by the slower-acting barbiturates.

Tetanus

Recently Firor, Lamont, and Shumacker (1940), in a study of the cause of death in tetanus, observed in dogs with general tetanus that the injection of a usually safe dose of nembutal would kill the animal in a short time. They also observed that, when tetanus toxin was given intravenously, the administration of enough nembutal or avertin to stop convulsions shortened life.

This method of intubating a dog for ether anesthesia is in use at the Institute of Experimental Medicine of the Mayo Foundation. Three things are essential: (1) the animal should be sufficiently anesthetized so that oral reflexes are abolished; (2) the animal must be placed straight and securely on its back; (3) the tongue should be pulled out of the mouth parallel with the long axis of the body

Convulsions

In the course of the past dozen years or so, increasing reports of convulsions during anesthesia have been appearing in medical literature. This certainly does not mean that the phenomenon was unknown prior to 1927, when the first reports were made, but is one more example of the value of calling attention to a morbid process: once described, many reports appear. A telling commentary on the confused state

of our knowledge of this occurrence is offered by a glance at the numerous and conflicting suggestions as to etiology. Nearly as many suggestions as to cause are offered as there are writers on the subject. Most of the papers are based upon speculation. Their value lies chiefly in their case reports, for, in viewing these reports as a whole, certain fairly constant features stand out. These offer a working description, as far as it goes, of the phenomena. A typical convulsion is described as usually starting with twitchings of the face. These quickly spread and soon involve the entire body in clonic convulsions which last from a few minutes to several hours. In the latter case they usually terminate in exhaustion, circulatory failure, and death. Respiratory failure may occur during the convulsions.

Lundy (1937) has tabulated 144 cases, chiefly from the literature. It is evident that convulsions occur under several anesthetic agents. The term "ether convulsions" is indeed misleading.

Preanesthetic Medication

While morphine sulphate has been used therapeutically for nearly 140 years, it is only comparatively recently that it has been used intravenously. About ten years ago this method began to be popularized in Europe. Vomiting follows intravenous injection less frequently than subcutaneous administration. Chief uses for the intravenous administration of morphine are: as an adjunct to regional anesthesia, for analgesia in peroral endoscopy and oral surgery, and for the rapid control of visceral colics. The advantages of intravenous administration over subcutaneous are that the drug can be administered at the moment needed, full analgesic effects are immediately obtained, and the dose can be regulated accurately.

The use of premedication in anesthesia or a basal anesthetic has several purposes, as has been pointed out in the foregoing. When larger doses of such agents are employed, the aim is to lessen the quantity of anesthetic agent required for a given level of anesthesia.. Calderone (1935) has measured the ether concentration in dog's blood at the onset of surgical anesthesia, again at the point of respiratory failure, both without premedication, and after morphine in doses comparable to those used clinically. The concentration of ether in the blood, with and without morphine, were practically the same in each case for the production of surgical anesthesia or respiratory failure. The same result was found after subanesthetic doses of amytal were given as preliminary medication. The agent had no effect upon the blood-ether concentration necessary to produce surgical relaxation or respiratory failure. When doses of this barbiturate great enough to produce anesthesia in their own right were used, a little less ether was required for respiratory failure than when ether alone was used. In these barbiturate experiments there was little, if any, summation of effect in the clinical range. The additive actions were not striking.

Generalization of the above findings is impossible at this time, and, indeed, some doubt is thrown upon their accuracy by the more recent study of Robbins, Baxter, and Fitshugh (1939). This group studied cyclopropane, not ether as Calderone did. Perhaps these two agents vary in regard to the effects of preanesthetic medication, but it seems unlikely. At any rate, Robbins and his associates found that in dogs, following the use of morphine considered to be comparable with that used clinically, the blood concentration of cyclopropane required to produce abdominal relaxation is reduced by 48%, that required to abolish the wink reflex is reduced by 27%, and yet the amount required for respiratory arrest is not reduced at all. The factor of safety with cyclopropane is thus increased. Similar results were obtained with amytal and sodium barbital premedication.

Barbiturates

In any consideration of the action of the barbiturates, several points are of interest: Why do some of the compounds act more quickly than others, even though all have been administered intravenously, and why does prolonged action occur in some cases and not in others? In an attempt to explain why, upon intravenous injection of the sodium salts of barbital and phenobarbital,

there is a marked delay in the onset of action, whereas with amytal, pentobarbital, and evipal anesthesia is produced promptly, Bush (1937) determined the apparent ionization constants of these agents. From these, the hydrolysis of the sodium salts and the acid-salt ratios at the pH of the blood were estimated; however, these values are such that there is no correlation apparent between them and the rate of onset of anesthesia.

Butler and Bush (1939) have considered the effects of N-methyl-barbital and of N,N¹-dimethylbarbital. The qualitative effects are similar. Apparent effects of small doses disappear quickly, but, following the administration of large doses, the first severe reactions are followed by prolonged, less intense effects. To account for this behavior they have suggested two very plausible explanations: First, that the rate of inactivation, although initially high, may decrease as the duration of anesthesia increases; second, that in the animal body these substances may be transformed into less active compounds, these less active agents producing the aftereffects of large doses.

Schonle, Keltch, Kempf, and Swanson (1933) have considered the elimination of barbituric acid in the urine. They state that a molecule of amytal is five times as effective as a molecule of barbital and that a molecule of pentobarbital is ten times as effective in producing anesthesia in rats. While 90% of small doses of barbital are excreted, only from 40 to 50% of large doses are excreted in the urine; so apparently the body can break down barbital. Amytal and pentobarbital are excreted in the urine of men and dogs only in traces, if at all, following the administration of their sodium salts.

Anesthesia and the Fetus

The introduction of many new sedative and anesthetic agents into obstetrics has had much to do with focusing attention upon the response of the fetus and the newborn to the anoxic effects of some of these drugs. An interest in this problem is certainly not new in many medical centers; but in the past few years a general awareness seems to have developed among some small animal practitioners of the routine practice in human obstetrics to administer certain agents for the comfort of the mother. The Boston terrier seems to have become synonymous with dystocia due to overdeveloped fetuses or underdeveloped pelves, and at the owner's suggestion perhaps, there has resulted unwise use of these agents. Corrective measures have too often arisen only after a disappointing experience.

It has been repeatedly demonstrated that respiratory movements are not initiated at birth. The beginnings of respiratory activity were recently shown by Barcroft and Barron (1936) to originate early in embryonic life. They have shown that in the sheep (which has a gestation period of about 157 days) rhythmic trunk movements associated with ordinary respiration are developed between the 38th and 49th days of fetal life. At this stage they cannot be elicited by asphyxial conditions of the blood. At about the 49th day the frequency of these movements becomes more rapid, and they become more powerful. After the 50th day the rhythmic movements disappear as a spontaneous phenomenon, but stoppage of the blood flow in the umbilical cord will elicit them.

The failure to recognize that the fetus has a special physiology has been responsible for much misconception. Snyder and Rosenfeld (1937) have amply demonstrated this. They have succeeded where others failed or obtained half truths, by a new approach to observation of the fetal respiratory system, new in that they dispensed with the complicating factor of anesthetics, except when specifically studying their effects. They employed a technique which involved inhibition of labor. They studied the fetuses of rabbits, cats, guinea pigs and human beings. Outstanding findings are that fetal respiratory movements are depressed or abolished by oxygen want. However, this does not establish that some oxygen want may not have been responsible for the initiation of the movements. They consider that the depression effected by oxygen want is evidence that the carotid body mechanism is not functioning in the

(rabbit) fetus before birth. Carbon dioxide deficit results in depression or apnea of the fetus. This shows that a certain level of carbon dioxide is essential to maintain fetal respiration; yet excess carbon dioxide has little or no effect. It is evident from these data that the fetus is peculiar in comparison with the mother; the failure of oxygen want or carbon dioxide excess to stimulate respiration is unlike the adult. The rate of respiration of the fetus varies according to the stage of its development. It is several times more rapid in postmature fetuses than in premature ones. The respiratory system of the fetus is peculiarly sensitive to anesthesia; respiratory movements of the fetus may be abolished at a level of analgesia at which respiration is not impaired in the mother. Ether, nitrous oxide, divinyl ether, paraldehyde, phenobarbital, pentobarbital, and chloral hydrate all were found to have depressing actions. Great significance must be attached to the finding of the extreme sensitivity of the fetus to the depressant effects of the common anesthetic agents.

Analeptics

Recently study of the analeptics has been progressing at such rapid rate that there is a temptation to confuse promising experimental findings with clinical observations.

When used in doses short of convulsant ones, metrazol and picrotoxin were found to be significantly depressant, yet coramine appeared to be depressant in doses which were not convulsant. When convulsions occurred under metrazol and picrotoxin, the ensuing depression appeared due to the exhausting effects of the convulsions rather than primarily to the drugs. The actions of coramine and metrazol were found to be characterized by early peak effects, whereas the maximal action of picrotoxin was delayed as much as from fifteen to thirty minutes. Allowance must be made for this in therapy.

When rapid, complete arousals from great barbiturate depression are produced by metrazol or picrotoxin, such arousals may be accompanied by dangerous convulsions; therefore, Werner and Tatum point out that immediate, complete reversal of the depression should not be attempted in the treatment of severe barbiturate poisoning, but, rather, that one should be satis-

field with a lesser degree of steady improvement.

The conclusions reached by Marshall, Walzl, and LeMessurier (1937) are that picrotoxin is very effective in reinstating respiration when failure is due to phenobarbital anesthesia plus carotid sinus inactivation. Strychnine they found to be ineffective in the above condition.

In judging cerebral analeptics on the basis of their effectiveness as antianesthetics, picrotoxin appears to be the safest and benzedrine the least safe. Benzedrine should be used during anesthesia only with great caution. Picrotoxin, metrazol, caffeine, and ephedrine were found to be effective in that order.

Cutting and Koppanyi (1938) have used massive intravenous infusions of isotonic glucose or saline solutions, in volumes weighing from one-fourth to three-fourths the body weight in cats and dogs which were anesthetized by sodium barbital or sodium phenobarbital. The duration of the anesthesia has been shortened to from one-third to one-half that of controls, with the doubling of the early elimination of these drugs in the urine. The significant observation has been repeatedly made that, unless infusions were started and pushed with vigor within about one-half hour after the administration of fatal doses of the barbiturates, the infusions were without avail. Apparently the infusions are effective only if they can prevent critically high levels of the agents from accumulating in the nervous system.

Treatment of Allergies with Histaminase*

Histamine is widely distributed in the human body, occurring in many tissues. It is formed in the intestinal tract through bacterial action by decarboxilation of histidine, one of the amino-acids derived from protein. Code showed that histamine can be extracted from the blood, the major source being the granular leucocytes. Eosinophilia patients in most instances show concentrations exceeding the upper normal value; this may be one reason for the development of allergies in connection with intestinal parasitism. Histamine is removed from the blood by perfusion through the dog's kidney, indicating that destruction occurs in this organ and that very little is excreted in the urine.

Histamine produces stimulation of the smooth muscles, particularly those of the uterus, bronchioles and, to a lesser extent, the intestines. It increases the flow of gastric juice, and stimulates pancreatic, lacrymal and salivary secretion. When present in normal amounts (0.04 gamma per lcc) it increases the blood supply to certain tissues and stimulates gastric secretion. However, it is toxic when present in greater amounts.

The great toxicity of even small quantities of histamine has been demonstrated by several workers. Recently Brocq-Rousseu *et al.*[1] found the minimum lethal dose of histamine, injected intravenously, to be 2 to 3mg per kilogram of body weight for the rabbit, ½ to lmg per kilogram of body weight for the horse, and about 10mg per kilogram of body weight for the dog. They describe the effects of the injection of 0.64mg per kilogram of body weight into a horse (the equivalent of about 4.5gr for a 1000-pound animal), as follows: the animal immediately showed marked symptoms of distress, with urination, defecation, salivation, lacrymal secretion; increase of respirations to 48 per minute and of pulse beats to 200 per minute; intense congestion of the mucous membranes; marked dilation of the pupils of the eyes. Dyspnea rapidly developed and in a few minutes the animal went down, all the symptoms increased in violence, a heavy sweat broke out, and ten minutes after the injection, the horse died in agony. An autopsy was immediately performed, disclosing the blood to be black and coagulated; there was an acute pulmonary edema, and the mucosa of the entire respiratory tract was covered with petechiae. There were large hemorrhagic areas on the endocardium, and petechiae on the pericardium. The cerebrum, cerebellum, liver, kidneys and spleen were greatly congested.

When the injection of such a small quantity of this substance can produce such dramatic effects, it can be readily seen that even a slight increase of the histamine normally present in the body can produce toxic symptoms. Anaphylactic shock and many allergic disorders are essentially manifestations of histamine poisoning.

Histaminase is the detoxicating agent for histamine. It is present in various tissues and body fluids, including the lung, liver, kidney, blood, muscle, spleen, adrenal gland, duodenum, jejunum, and cecum. The greatest activity is found in tissue from the kidneys and small intestines. The neutralization or inactivation of histamine appears to be oxidative in nature. Perfusion experiments indicate that in the dog the kidney contains more histaminase than other tissue, with the exception of the intestine. The amine is destroyed during passage from the lumen of the gut into the circulation.

Torantil is histaminase produced from the mucosa of the small intestines and the kidneys of hogs. It is indicated in skin disorders of presumably allergic origin, such as eczema, urticaria, atopic dermatitis, and angioneurotic edema, as well as in bronchial asthma, and so-called protein poisoning in dogs. The dosage depends upon the size of the animal and its tolerance for the drug. The usual dose is five units night and morning before feeding for a dog weighing 20 pounds or under, the dose being increased five units for each additional 20 pounds of weight.

J. GILBERT HORNING.

Houston, Tex.

[1] Brocq-Rousseu, D., G. Roussel and J. Verge, 1940. Recherches sur la toxicité de l'histamine. *Revue de Path. Comp. et d'Hyg. Générale*, No. 517, pp. 14-16.

* Presented at the 16th Annual Conference for Graduate Veterinarians, Alabama Polytechnic Institute, Auburn, Ala., March 20-22, 1940.

The Fundamental Role of Thiamin In Canine Nutrition

By JOHN W. PATTON,
East Lansing, Michigan

A STUDY of the literature shows that thiamin (vitamin B_1) is beneficial for a great many conditions, yet specific for very few. It is rather unique that a substance could be so generally beneficial and yet therapeutically cure nothing in particular—at least permanently. For better understanding of the foregoing, it is important that we draw the line of demarcation between thiamin, a dietetic substance which prevents, and thiamin, the therapeutic agent which ameliorates various ailments.

Thiamin Crystals

The second fact we must keep in mind is the fundamental role which thiamin plays in cellular metabolism. The living organism is made up of countless numbers of cells. These cells in turn are grouped for special functions. For example, the liver is a group of specialized cells, and their specialization is phagocytosis, secretion of bile salts, excretion of pigments, deaminization, urea formation, glycogenesis, detoxification of organic poisons, fibrinogen formation.

But each cell in the body, irrespective of its specialized function, must still operate as an individual unit in a general functioning of cells. To quote Williams and Spies,[1] who so aptly express this thought:

"Just as each individual in a human society must eat his own food and keep his own home fires burning, so every cell, regardless of its function in a society of cells, contains its own kitchen and heating system."

It is to the physiology of the individual cell that we must look to understand the importance of thiamin, and why its absence in a diet causes such profound and generalized symptoms on the one hand, and why on the other, it acts like a panacea, yet cures nothing specifically, in the sense that sulfapyridine, for example, cures certain types of pneumonia in man.

The unit of life in many of the processes of the living organism is the individual cell. Cellular metabolism, therefore, is a basic function of life. One of the functions of the individual cell, regardless of structure, nature, or specific function, is to metabolize the food substances brought to it by the circulation, and this involves oxidation, reduction, synthesis, and disposal. The cell

[1] Williams, R. R., and T. D. Spies. *Vitamin B_1 and Its Use in Medicine*, p. 332.

may be likened to the firing chamber in the motor of an automobile, where the vaporized gasoline is compressed and fired, and the exhaust removed.

■ It can be seen, therefore, that any dysfunction in an individual cell can affect a group or society of cells—liver, heart, muscle, nerve, etc.,—with resulting impairment of the specialized functions of these organs and the symptoms peculiar to or characteristic of dysfunction of any one or any combination of them. It can further be seen why thiamin deficiency has such a profound and generalized effect on the living organism. It is not so clear just *how* thiamin exerts its influence on cellular metabolism. The prevailing opinion, however, is that thiamin is especially concerned with carbohydrate utilization *within* the cell.

On diets deficient in thiamin, provided that a relative deficiency of thiamin exists within the body, it appears that carbohydrate metabolism within the cell is incomplete, and lactic and pyruvic acid excesses develop. It is not as yet clear whether thiamin functions as a catalyst or as a partner in a chemical reaction. It is suggested by some that thiamin works through its pyrophosphoric ester (cocarboxylase) which unites with pyruvic acid to form long fatty-acid chains.

It is only reasonable to expect, therefore, that when any substance is as fundamentally vital to cellular metabolism as thiamin is accepted as being, its lack would have a broad dysfunctional effect on the organism as a whole. And this is the case with thiamin deficiency. Note the wide scope of the symptomatology and pathology of thiamin deficiency in man:

SYSTEMS INVOLVED AND LESIONS OBSERVED IN HUMAN VITAMIN B_1 DEFICIENCY

System	*Lesions*
Alimentary tract	Anorexia; decreased motility; hypochloridia; dystrophy of intestine.
Cardiovascular system	Acute cardiac failure; edema; serous effusions; bradycardia.
Nervous system	Ascending, symmetrical, peripheral neuritis — muscle cramps, numbness; ataxia and lack of coordination; polyneuritis; myelin impairment; nerve cell degeneration.
Endocrine system	Adrenal hypertrophy; thymus, pituitary, thyroid and liver atrophy.
Respiratory system	Reduced cellular oxygen uptake; increased respiratory rate.

The symptoms in dogs suffering from uncomplicated, acute thiamin deficiency induced experimentally are: fear or timidity, as manifested by cringing (whipped attitude); seeking seclusion in darkened and out of the way places; irritability; nervous running-howling complex; epileptiform fits; respiratory and circulatory stimulation; fixed stare and apparent blindness (running into objects); hypersensitivity; tucked up abdominal appearance; emaciation; spastic or steppage gait; posterior weakness; wobbly gait. It will be noted that this syndrome corresponds very closely to symptoms listed for man.

■ It is nearly two years since we published our report on fright disease, in which we stated that we had produced, treated, and cured a condition manifested by a syndrome indistinguishable from that referred to by

A revolution is taking place in America. Again this nation is asserting the individual's inalienable right to life, liberty, and the pursuit of happiness. But this revolution is not undertaken to release 3,000,000 Americans from political tyranny; it is to rescue 45,000,000 Americans from the tyranny of chronic famine. The weapons in the new revolution are not the traditional fire and sword, bullet and bomb; they are the tiny entities known as the B-complex vitamins. And the revolution is being started by one seemingly prosaic fact—the Food and Drug Administration is promulgating a new definition of flour. The implications of this simple statement are tremendous. Essentially it means that, probably for the first time in the history of mankind, an entire nation is deliberately revolutionizing a staple food as a health measure, by adding B_1, the "morale vitamin," to its daily bread.

Fig. 1. Fright Disease Due to B_1 Deficiency. **Fig. 1a. Early stage—timid, easily frightened, cringes from the hand. Fig. 1b. Very timid and excitable. Startled at drop of pan. Fig. 1c. Note wild expression. Ready to start on a running-howling-nervous complex. Fig. 1d. Extremely nervous, fearful, photophobia, seeks seclusion. Spasticity of muscles of hind legs. This and the halftones on pages 159 to 163, inclusive, were used with Doctor Patton's original article on this subject**

veterinarians and laymen as fright disease, running fits, or hysteria in dogs. This condition was produced on a diet deficient in vitamin B_1 in relation to the amount of carbohydrates fed. In the case of the young growing animals, severe symptoms developed on or about the 12th day. The critical symptoms of the syndrome were ameliorated by the injection of thiamin, and the cause subsequently removed by the inclusion of thiamin in the diet. This led to the conclusion that so-called fright disease or hysteria is basically a vitamin B_1 deficiency.

Since the publication of the original report, this experiment has been repeated several times, and certain other aspects of the problems have been investigated. We have been able to take these same dogs, feed them the same deficient diet with and without thiamin, keep them under the same controlled conditions, and entirely prevent, promptly cause, or completely relieve any appearance of fright disease, or the slightest symptoms of nervous dysfunction, and to do this repeatedly with great regularity in the onset, course and disappearance of the symptoms. Thiamin was the key to the situation. With it we could unlock the symptoms at will and just as unfailingly close them up again.

The famine from which an estimated 45,000,000 Americans are suffering is not due to lack of food in this land of plenty, but to lack of vitamin B_1 and certain other members of the B complex. Victims of thiamin starvation are not hungry. On the contrary, they have no appetite and do not want food. They are tired, weak, nervous, easily frightened, worried. Many of them do not feel like working, and they appear to be lazy and "ornery." On the other hand, increasing the daily ration of thiamin above the accepted adequate amount increases mental alertness and almost doubles the capacity for physical work, according to the experts who are advising the federal Food and Drug Administration and the commercial milling interests.

All of this enables us to reiterate that a syndrome which appears to us to be indistinguishable from a field condition commonly diagnosed as fright disease, running fits, or hysteria, can be interpreted in the light of the accepted physiological action of thiamin and our research on thiamin deficiency, only as a thiamin deficiency.

By fright disease we mean that condition in dogs which is manifested by a syndrome in which the chief symptoms are: timidity, fear, loss of weight, nervous running-howling complex, epileptiform convulsions, spastic paralysis, etc. This syndrome is most frequently observed in young growing dogs, during pregnancy or lactation, as a precursor, during or following illness, or during increased activity or extreme exercise (hunting dogs). It is generally benefited by a change in diet, especially to one including meat, milk, eggs and vegetables.

■ The justification for calling the experimentally-produced syndrome fright disease rests upon the following facts:

1. Many veterinarians who have seen our film depicting our research on thiamin de-

ficiency have stated that they are unable to distinguish between the syndrome we produced and that which they observe in the field and upon which a diagnosis of fright disease is made.

2. After a study of so-called fright disease in the field, both in this country and abroad, we are unable to distinguish any difference in the syndrome produced experimentally and that observed in the field. Further, we have treated successfully with thiamin field cases in dogs diagnosed by the veterinarian in charge as fright disease.

3. Foods charged with producing fright disease have been assayed and found deficient in thiamin, and the addition of thiamin to these same foods was successful in preventing any further occurrence of the syndrome.

While the demonstrated benefits of additional thiamin in the diet would make it highly desirable to include greater amounts in the nation's diet at any time, it becomes increasingly important to a nation facing a crisis when the people's physical stamina and mental courage may be the deciding factors in the struggle.

■ It has been pointed out that thiamin plays an important rôle in cellular metabolism, especially in connection with carbohydrate utilization. Veterinarians and a great many dog owners have observed that so-called fright disease is most prevalent in dogs fed on a diet high in refined carbohydrates, and the standard veterinary treatment for such dogs, it will be remembered, has been to change the diet from a high carbohydrate to a diet basically meat, milk, eggs and vegetables. Veterinarians and dog owners have reported that they can with certainty produce fright disease at will by feeding exclusively, or almost exclusively, certain brands of biscuit or kibbled dog food. Baked dog biscuit is essentially a high carbohydrate diet; the average formula for baked biscuit calls for from 60% to 70% of white flour—a high carbohydrate notoriously deficient in thiamin. Not only is the average dog biscuit formula deficient in thiamin in relation to its high percentage of non-fat calories, but the baking process can readily destroy most of the thiamin present, unless extreme precautions are observed in both the biscuit formula and the manufacturing technique. In other words, unless dog biscuits are scientifically planned to include an adequate content of thiamin in the formulae and to retain it by the methods of processing, a deficiency of this vital substance is an inherent characteristic of such foods. It is a matter of common knowledge that the average dog breeder or kennel owner who feeds kibbled food (broken baked biscuit) has learned from experience—often costly experience — that he must add fresh meat and a mixture of vegetables or unrefined cereals if he is to avoid certain nervous manifestations—premonitory symptoms of the syndrome called fright disease.

It is not intended to give the impression that all baked dog biscuits are deficient in thiamin or can be expected to produce a thiamin deficiency or fright disease. Such is not the case. One of the most salutary effects of the original report was an immediate action on the part of various progressive manufacturers of dry dog foods

Fig. 1e. Marked spasticity of muscles. Unable to run owing to rigidity. Attempts to climb but tumbles back. Fig. 1f. Just coming out of a convulsive seizure. Fig. 1g. Fully conscious after a convulsion and wondering what happened to him. Fig. 1h. Clonic convulsion—howling, struggling, foaming at the mouth; a pitiable sight

Why is the national diet deficient in thiamin? Because bread and other cereal products, which are low-priced and bulky foods, comprise over one-fourth of our total food intake; and because the pure white flour from which most of our bread is made has been deprived of most of its thiamin, as well as other valuable vitamins and minerals, in the milling process. For years nutritionists have been urging Americans to eat whole wheat bread; but wholesale education is uphill work, and only about 2% of all bread sold in the United States is of the whole wheat variety. If Americans insist on white bread, the only way to increase the general thiamin intake is to put it into the white flour from which the bread in general use is made.

to modify their formulae to include a plentiful quantity of vitamin B_1 in their foods and to adopt processes of manufacture to preserve it in the final product. Thus by discrimination the dog owner may now obtain a variety of dry foods better than any that were available previously, in fact, adequate and more than adequate in vitamin B_1, which may be regarded as the most critical vitamin in dog foods. It is essential to the well being and even the life of the dog; it is not materially stored in the body, so that an uninterrupted intake is required; and it is more likely than any other of the well known vitamins to be deficient in rations upon which domestic dogs are maintained.

■ As was stated in our previous report, we inadvertently produced thiamin deficiency and severe nervous symptoms several years ago, while studying certain aspects of the nutritional requirements of young and fast-growing puppies; and corrected this mistake by feeding the most available and potent source of thiamin—B_1 reference standard. Although occasion to observe and treat thiamin deficiency occurred in subsequent experiments, it was not until several years later that the opportunity developed to make a special study of this subject.

At first synthetic thiamin-deficient diets were fed; but it was realized early in the study that the animals would not eat sufficient quantities of these diets to produce acute and uncomplicated symptoms of the fright-disease syndrome. The onset of the syndrome was delayed until complicated by other deficiencies and conditions incident to malnutrition.

Feeds alleged to produce fright disease in the field were brought to the laboratory for bio-assay and study, and found to be deficient in vitamin B_1. We then formulated feeds deficient in vitamin B_1 and had these baked commercially. When fed, they were supplemented by a daily intake of all known vitamin factors except thiamin. Under this procedure, the animals ate these diets in sufficient quantities to produce the same syndrome that was observed in the field. It was interpreted to be the result of thiamin deficiency.

Having a feed which the experimental dogs would eat in sufficient quantities to produce the syndrome observed in the field, and a diet in which, to the best of our

Fig. 2a. Characteristic early attitude; timidity and whipped appearance. Fig. 2b. Early stage. Very characteristic attitude at feed pan—all feet bunched together, somewhat unsteady, braces self with nose. Hyperesthesia. Fig. 2c. More advanced symptoms of incoördination. Posterior weakness, braces self to stand, sometimes lifts both hind feet off the floor. Muscles of the hind quarters very spastic. Fig. 2d. Weak behind, sits down to eat, braces the feet far apart. Wobbly when he walks

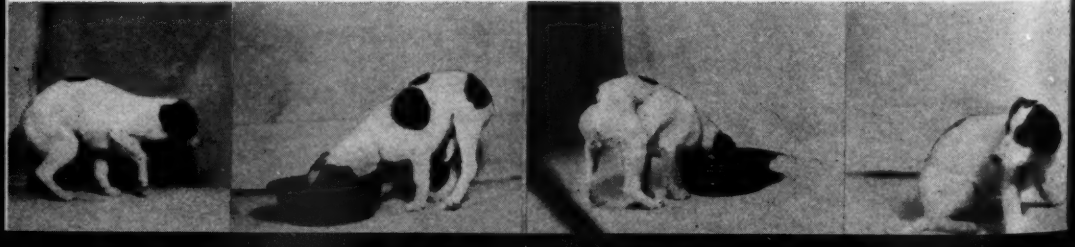


Fig. 2e. Starting frantically and blindly for parts unknown. Fig. 2f. Twenty-four hours after treatment was commenced. Appearance and action nearly normal. Fig. 2g. Severe paraplegia and also weak in front; the condition on the 11th day. Paraplegia that appears early is very stubborn; that appearing later yields promptly to treatment

knowledge, thiamin was the only lacking nutritional factor, it was expected that the inclusion of this vitamin in the diet would correct most of the syndrome observed. This was just what occurred, provided that the condition had not progressed too far. We were able to suppress the symptoms by feeding thiamin in many cases, especially in the earlier stages. It was necessary to inject thiamin hydrochloride hypodermically for more prompt and certain recovery, in fact for any improvement, in far advanced cases. In such cases, the animal's digestive system seemed to be so severely affected as to be unable to absorb the thiamin incorporated in the diet.

Not a single experimental animal was lost as a result of this research,[2] notwithstanding that the syndrome in many of the animals was carried to an alarming stage. The key to complete recovery was always at hand —thiamin by injection to control it, and, at the termination of the experiment, a diet adequate in thiamin. The syndrome was equally easy to prevent by the inclusion of thiamin in the diet, using the same experimental animals, and of course the same diet.

■ We have been asked frequently as to the pathological findings. They comprised no part of this study. We were concerned not with the pathology, but with symptomatology, prevention and cure. It was no part of our plan to sacrifice animals for necropsy, and as previously stated, none were permitted to succumb to the disease. Further, the pathological changes have been studied by others, we think adequately.

[2] Each of the two groups of dogs employed in the original experiment has been reduced by one animal. One of the young dogs escaped through a window nearly six feet from the floor during an attack of fright disease, and dashed madly away to be seen no more. One of the adult animals developed complete paraplegia which persisted for several months until euthanasia was induced.

■ Perhaps the practical application of these findings can be discussed to advantage. Since the original report was published, several hundred thousand doses of thiamin have been administered to dogs by more than 2000 veterinarians and others. Reports on a considerable number of these cases have been collected. In the majority of acute cases, the results have been approximately those attained under the controlled experimental conditions. However, many have disregarded a statement that received emphasis in the original report; namely, that under field conditions the great ma-

Several methods have been devised for retaining or adding thiamin and the other valuable vitamins and minerals found in wheat to white flour. These have been developed to the point where they can be economically employed, and several important milling concerns have already adopted one or another of them. It has been estimated that the new bread can be made to sell for about one cent more per loaf in the beginning, with a decrease in cost likely when methods are further improved. Depending on the method used, the new bread either resembles ordinary white bread in appearance, or is slightly creamy in color; the flavor is either unchanged or improved by a slightly nutty flavor. In other words, there is little or no change in taste or appearance.

Fig. 3. Fright Disease Due to B_1 Deficiency. **Fig. 3a. Early stage, timid, fearful, yelping. Photophobia. Would eat if alone. Fig. 3b. Extremely nervous. Jumps back when the pan is moved. Note tail between legs and braced hind legs. Spasticity behind. Fig. 3c. Unsteady, braced fore and aft, spasticity extends to all quarters, muscles becoming rigid, wobbly gait. Marked hyperesthesia**

jority of cases develop more slowly than do those produced under experimental conditions and are likely to be complicated by other vitamin deficiencies, for which appropriate treatment is required. Such animals may require, in addition to the thiamin, added amounts of nicotinic acid, riboflavin, vitamins B_4 and B_6, and/or various other nutritional factors. Another complication which may arise is that of infections with organisms ordinarily saprophytic, but pathogenic in the weakened condition of the animal. Those who disregarded this warning have in many instances had disappointing results from the use of thiamin.

As is often the case, many practitioners have placed too much emphasis on the remedial agent, and paid too little attention to the conditions under which it operates. For instance, although experimental animals suffering from severe symptoms of nervous running-howling complex are benefited by injection of thiamin, this benefit is brought about by the effect of the thiamin on the utilization of carbohydrates. It ameliorates or entirely relieves, according to the amount supplied, the symptoms brought about by the carbohydrates eaten with but a sub-optimal amount of thiamin in the diet and the tissues. It is obvious that, if the animals are continued on diets high in carbohydrates and low in thiamin, continuous injections of thiamin are necessary. Permanent relief therefore rests primarily not with the treatment of the symptoms, but rather with the prevention of the condition; that is, by providing the requisite amount of thiamin in the regular diet and of course by properly treating such complications as may have developed. Lessening the carbohydrates in the diet or reducing the non-fat caloric ratio has, in a measure, the same effect as providing more thiamin, but this is not always the easiest or the most practical plan to pursue. This is seen in the time-honored procedure of changing the diet of biscuits to one of milk, meat, eggs, etc., and after a time going back to the old diet because of convenience, low cost, or for some other reason, and of course getting into difficulties again.

An even more frequent error made by veterinarians is in regarding only the occurrence of running fits or fright disease as

The legal definition of white flour is "the fine ground product obtained in the commercial milling of wheat consisting essentially of the starch and gluten of the endosperm. It contains not more than 15% of moisture, not less than 1% of nitrogen, nor more than 1% of ash, and not less than 0.5% of fiber."

The Food and Drug Administration is now working on a new definition for white flour-with-vitamins-and-minerals. This will not replace the old definition, but will merely make the new type of flour and bread legal, and thus implement the drive to educate the public to its use. With the public as vitamin-conscious as it already is, it should not be too difficult to persuade it to change to a bread which looks and tastes like the old bread, and which costs about the same, but which contains essential health-ingredients lacking in the old.

indications for increasing the thiamin or lessening the carbohydrate in the diet. These manifestations are the results of an extreme and acute deficiency. The borderline cases, which are in this way overlooked, are in the great majority. There are hundreds, perhaps thousands of these borderline cases to one of the severe, acute cases manifested by running fits.

In our original report, and it is worth repeating here, we stated that additional thiamin (i.e. in addition to the amount ordinarily required) is indicated wherever and whenever the metabolism is raised, as in fevers or acute infectious diseases; or during growth, pregnancy and lactation; or when the intake is restricted, as following operations; or where there is inappetence from any cause; or during excessive muscular activity, as during the hunting season. Keeping this in mind is an aid in diagnosis. It does not follow that because an animal has been on a given diet for weeks or even months without breaking down and then under changed conditions develops the premonitory symptoms of thiamin deficiency that thiamin is not indicated. Its thiamin requirement may have been increased to a point where the content of this vital factor in the diet theretofore adequate is no longer sufficient.

The thiamin requirement of animals is most variable, and fluctuates within wide ranges. The deficiency syndrome is also variable. It may vary in intensity and individuals may vary in their reaction. Under extreme, acute conditions the symptoms may resemble furious rabies, so-called brain tumors, or running, barking fits, accompanied by such symptoms as relative anorexia, loss of weight, muscular incoordination, ataxia, wobbly gait and posterior paralysis; in less acute cases, the syndrome may be chiefly anorexia, loss of weight, irritability, wobbly gait and ataxia; in borderline cases, there may be only slight indication of inappetence, timidity, or periodic attacks of slight irritability. No dog maintained on a diet that wavers along the margin of thiamin insufficiency can be a very satisfactory pet or companion nor much other than a disappointment as a working dog.

The growing utilization of vitamin B_1 in human foodstuffs has an additional significance to the veterinarian, aside from his appreciation of the benefits of inclusion of the "morale vitamin" in the nation's diet. Many animal feeds are made largely from by-products of foods prepared for human consumption. The thiamin retained in the human food is thereby withheld from the animal feed. If the trend toward human use of vitamin B_1 continues (as it should), there is a growing need for the veterinarian to watch carefully the thiamin adequacy of the rations of the animals under his care. As Doctor Patton stresses in this article, this is particularly true in the case of dogs.

The role of thiamin in canine nutrition is important, therefore, because, although some animals synthesize their own thiamin, dogs apparently have no such ability. Dogs are commonly fed diets that require relatively high amounts of thiamin for their utilization, and thiamin intake is an almost daily necessity because of the relatively poor storage in the animal tissues.

Fig. 3d. All symptoms more marked than in 3c; posterior parts somewhat paralyzed; rests weight on fore legs. Wobbly gait. Fig. 3e. Very unsteady on feet. Tendency to sit down much of the time. Acute hyperesthesia. Fig. 3f. Posterior paralysis—almost the first symptom shown by this dog

Sheep Nutrition[1]

By L. D. FREDERICK,[2] Chicago, Illinois

THE sheep industry is growing rapidly, having spread in recent years from the great open spaces of the west to the agricultural sections of the east and central states, where there are now a great number of small flocks and small feeding operations. It therefore behooves veterinary practitioners in all parts of the country to take cognizance of the nutritive requirements of sheep and lambs, and to be in a position to discuss this subject with sheep husbandrymen, as well as to use this knowledge in the diagnosis and treatment of ovine diseases.

The number of sheep on ranches and farms at the close of 1939 has been conservatively estimated at 50,000,000. (This does not take into consideration the lambs that were raised and marketed between censuses.) The importance of this large industry is obvious, as is the necessity for a sound program of sheep raising, including provision for adequate nutrition.

Sheep are easy to raise. They can subsist on roughage around the ordinary midwest farm, or they can be brought along with a little supplemental feeding on ordinary hay and perhaps be run in the corn stalk fields in the fall. But they must be watched carefully for signs of impending trouble, and particular attention must be given to nutrition during the breeding cycle.

The nutritional requirements of sheep at different stages will be discussed in this paper, as follows: the requirements of adult animals at breeding time, during the gestation period, immediately before lambing, at lambing time and immediately thereafter, and during the nursing period; and lamb feeding methods and rations. The common nutritional diseases will also be discussed.

In most areas the ewes are bred for spring lambing, which suits best with weather conditions in most parts of the country. In some areas the so-called hothouse lambing program is used, and the ewes are bred earlier. The period of gestation is 143 to 147 days in the coarse-and-medium-wooled breeds, and 150 to 152 days in the fine-wooled.

Unless both ewes and bucks are in the proper physical condition in the fall, unsatisfactory breeding results can be expected. The old Scottish custom of "flushing" is recommended at this time. This consists simply of feeding a nutritious, balanced ration for a period of two to three weeks before breeding. It is not necessary to feed the animals as if fattening them for slaughter, but merely to supply enough protein and energy factors to start them gaining slightly. This nutritional stimulation brings the ewes into estrum more promptly, and they are much more likely to become pregnant on being bred.

Frequently sheep raisers "flush" the ewes before breeding, but neglect the bucks, expecting them to give good service without any special attention. It is just as necessary to have the buck in good condition—not fat, but in first-class physical condition—because of the additional strain on his reproductive organs during the breeding season. He should be gaining rapidly when he is turned in with the ewe flock, and should receive a ration consistent with his activity during the breeding season.

During gestation the ewes can get along on a less abundant nutritive supply than while being "flushed" for breeding. Their diet can be chiefly roughage, but they should receive enough supplementary concentrates to keep them gaining nicely. They should gain approximately 15 to 20 pounds from the time they are bred until lambing, but should not be allowed to become overly fat, since this is detrimental at lambing time. The digestible nutrients required by ewes from the time they are bred until four to six weeks before lambing are given in Morrison's feeding standards. Ewes weighing from 100 to 120 pounds should be fed 2 to 2.5 pounds of dry matter containing 1.5 to 2.0 pounds of digestible nutrients of

[1] Presented at the 53rd annual meeting of the Indiana V. M. A., held at Indianapolis, Jan. 14-16, 1941.

[2] Chief Veterinarian, Swift & Company, Chicago, Ill.

which 0.16 to 0.2 pounds is digestible protein. This gives a nutritive ratio of one part of protein to 7.5 to 8 parts of carbohydrates and fats. Heavier ewes, weighing 130 pounds and over, should be encouraged to consume 2.5 to 3 pounds of total dry matter, having a digestible nutrient value of 2.0 to 2.5 pounds, and containing 0.2 to 0.25 pounds of digestible protein, with the resulting ratio of proteins to carbohydrates and fats 1:7.5 or 1:8, as in the case of the lighter ewes. To supply such a ration for pregnant ewes, we suggest 2.5 pounds of a good quality legume hay, or 3½ pounds of mixed legume and grass hay, and around two pounds of good quality corn silage. As an alternative 2.5 pounds mixed timothy and clover hay, two pounds of good corn silage, and a protein supplement such as soy bean oil meal, cottonseed oil meal, linseed oil meal (or mixtures of these vegetable protein supplements; or mixtures of these and an animal protein such tankage or meatscrap), may be used with satisfaction. A complete mineral supplement should be supplied in all cases. It may be mixed with the ration or fed free choice.

During the last four to six weeks of gestation, when the fetus is developing very rapidly, a better feeding regimen is required for the development of a strong, healthy lamb. At this time nutrients should be designed also for the stimulation of milk production. During the preparturient period the 100- to 120-pound ewe should receive 2.5 to 3.25 pounds of dry matter with a digestible protein content of 0.2 to 0.25 pounds and a ratio of 1:7. Heavier ewes should receive a ration similar in quality but in a larger amount. Two and one-half to three pounds of legume hay, one-half to one pound of a grain mixture such as half oats and half corn, and one-quarter pound of a protein supplement (either vegetable or mixed vegetable and animal protein) will provide the foregoing ration. The amount of concentrates should be governed by the physical condition and general well-being of the ewe and fetus. A complete mineral mixture should be included in this ration or fed free choice.

The sheep feedlots are stocked from such bands as these

The ewe should be fed rather sparingly the day that she lambs and the day after to avoid digestive disturbances, which are quite often encountered at this time in ewes that are overfed. Afterwards, adequate nutrition is required, since the lactation period is quite depleting for a ewe. A slightly higher percentage of protein, of higher digestibility, is required at this time. For the 100- to 120-pound ewe, the requirement is approximately 2.9 to 3.5 pounds of dry matter, carrying 0.25 to 0.33 pounds of digestible protein with a total digestible nutrient content of 2.33 to 2.8 pounds—a nutritive ratio of 1:6.5. Heavier ewes of course require a larger amount of the same feed. The general condition of the ewe should be

the guide to the amount. In the spring, when the ewes have no chance of getting out to pasture, it has been found necessary to feed from one to 1.5 pounds of concentrates in the form of grain and supplements.

While the ewe is nursing the lamb, we prefer to feed a mixture of grains: 50% whole oats, 40% coarsely cracked corn, and 10% bran, in which is incorporated a protein supplement in the amount of approximately one-quarter pound per animal per day. The mixed protein supplements mentioned in previous paragraphs are suitable. A mineral supplement should be added to the concentrate mixture or supplied free choice.

When the ewe is on pasture, the amount of concentrate mixture necessary is determined by her physical condition. She must be fed enough to supply the nutrients necessary for milk production in a quantity sufficient for the development of a strong, fast-maturing lamb, and also for her own maintenance in good physical condition.

It must be remembered that sheep are herbivorous, and that their digestive mechanism is geared to digest and assimilate large amounts of roughage. Lamb feeders encounter difficulties when they try to fatten lambs in short periods by feeding them a ration high in concentrates and low in fibrous material. This insult to Nature is usually avenged by heavy death losses.

The role of nutrition in the prevention of certain pathological conditions which commonly occur at lambing time is well recognized. We refer particularly to pregnancy disease (lambing paralysis) of ewes. If the proper balance of nutrients is maintained in the ration, and if it is supplied in sufficient amount where good husbandry prevails, little or no pregnancy disease is encountered. This disease is usually seen in ewes carrying or nursing twin or triplet lambs, but occasionally affects ewes with but one lamb, usually a large, strong one. It is due apparently to a disturbance of the normal carbohydrate and fat metabolism, resulting in an extensive acidosis. The feeding regimen given in the foregoing is a successful preventive. If it is not practical to supply the amount of grain indicated, a small amount of molasses or unrefined sugar is a fairly satisfactory substitute. Without the proper amount of a simple sugar, hexose, it is impossible for the animal

Pregnancy Disease—*Photo by Baker*

mechanism to metabolize fat. If this hexose is not present or if digestion and assimilation are not stimulated by exercise, fats are not properly metabolized and ketone bodies are formed and accumulate in the blood, causing acidosis.

Adequate and proper exercise should be insisted upon. It is a major factor in the prevention of pregnancy disease of ewes. This disease is not always encountered in the poorly-nurtured; it occasionally occurs in well-nurtured or overly fat ewes. In such cases it is due to an upset in metabolism, usually due to a lack of exercise. Corrective measures are obvious; a program of daily exercise plus a rearrangement of the ration designed to reduce the excess fat is usually the treatment to recommend.

We find little evidence of mature sheep suffering from avitaminoses. Most of the vitamins required by sheep are either procured from the natural food supply or are synthesized by them in the course of normal digestion. There are some data which indicate that experimentally various avitaminoses can be produced. If good quality feeds in adequate amounts are used, vitamin deficiencies appear not to be encountered in sheep. In extremely dry years we find con-

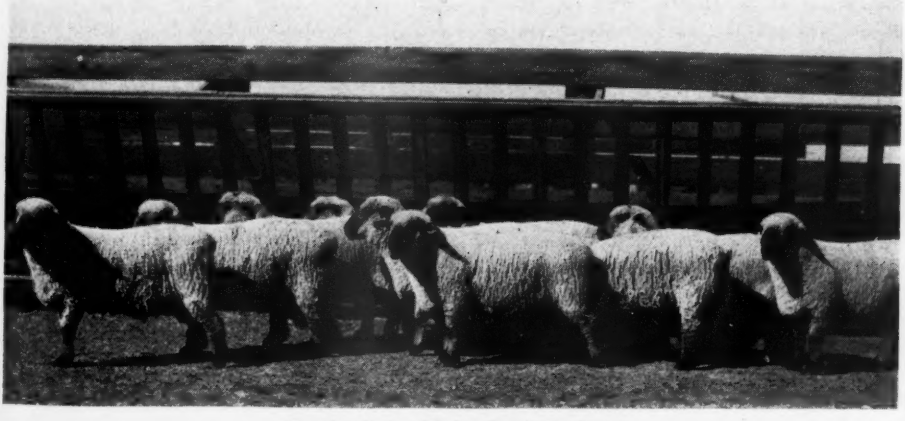
siderable nutritional keratitis in lambs coming into the midwestern feed lots. The pastures having dried up, the lambs must subsist on dry grasses of low nutritive value, particularly with respect to vitamin A content. When these lambs are put on a conditioning ration containing an adequate amount of green alfalfa hay rich in vitamin A, they recover promptly. This finding practically substantiates the supposition of a vitamin A deficiency as the cause of this type of keratitis.

Lactation failures are ascribed by some to endocrine failures and by others to inadequate nutrition. In the latter case, the foregoing suggestions as to nutrition are appropriate for its prevention. We cannot expect an improperly fed ewe to produce an adequate supply of nutritious milk for a fast-growing lamb.

There are several nutritional deficiency diseases of lambs. Two of the most important are nutritional enteritis and stiff lamb disease.

Nutritional enteritis is ascribed to vitamin A deficiency. In the northwestern section of the United States, noted as a great sheep ranching country, enteritis of lambs has been the limiting factor in lamb production on some ranches. Many have suspected a specific bacterial factor as being responsible for these losses. From an analysis of the ration fed and feed procured by the pregnant ewes through grazing, we suspected a vitamin A deficiency as being primarily responsible for this disease of the newborn lambs, and recommended that the ewes be fed a liberal allowance of green forage, preferably alfalfa hay, which contains a good supply of vitamin A, in addition to a balanced concentrate ration. Several years have elapsed since the use of this feeding regimen was adopted, and little lamb dysentery or enteritis of the type with which they had been troubled previously has been encountered since.

Another disease of lambs apparently involving some nutritional factors is that known as stiff lamb disease. The exact etiology of this disease is not known, but from research carried on by one of the experiment stations, it has been found that a ration made up of oats, barley, cull beans and second cutting alfalfa hay, when fed to pregnant ewes regularly, results in this disease in the lambs. On the other hand, the same group of workers were able to prevent the disease to an extent of almost 100%, even when using the same ewes that the year before had produced stiff lambs, by feeding a ration of oats, wheat bran, corn silage, and a mixed clover and timothy hay. The explanation as to why the disease should result when the former ration is fed or why it is prevented by the latter ration, must be left for further research. We know, however, from practical experience, that by using rations such as the latter, or modi-



Crossbreds for Market Lamb Production
From Hampshire rams and Rambouillet and Corriedale Ewes. U. S. Sheep Exp. Station, Dubois, Idaho

fications of them, stiff lamb disease can be prevented satisfactorily.

Mineral deficiencies of sheep are not well explained in current literature. There is a condition in newborn lambs characterized by poor development of the skin and hoofs and a lack of wool, and usually by an enlargement of the thyroid gland. It is due to an iodine deficiency. The addition of as little as 0.05 grain of iodine to the daily ration of the ewe constitutes an excellent preventive. This may be supplied in the form of the relatively non-toxic sodium or potassium iodide. It may be given in the salt or preferably mixed with the mineral supplement.

Calcium, phosphorus, magnesium, manganese, iron, cobalt, copper, sodium, and chlorine are all necessary to the nutrition of sheep, and severe deficiency of any one or more of these minerals may result in unthriftiness and a poor return on a feeding operation.

Creep feeding of nursing lambs at the age when they can first begin to eat a little solid food is well worthwhile. A small amount of alfalfa meal mixed with coarsely ground oats, with a small proportion of corn, wheat bran and shorts, supplemented with a small percentage of animal protein concentrate and complete mineral supplements, provides an adequate ration for this type of feeding. Some midwest sheep raisers feed their lambs a good calf meal with satisfactory results. Growth and development are very gratifying. Also, it lessens the drain upon the ewe and aids materially in maintaining her general physical condition by cutting down the amount of milk needed by the lamb.

The feeding of lambs to fatten them has become an industry in itself—a distinct branch of animal production. It poses many problems for the veterinarian, in both nutrition and disease prevention. The method of feeding, the program followed, and the length of the feeding period are matters of the utmost importance in deciding upon the feeds to use, and how to prepare them.

There are three methods of feeding lambs in general use: the corn field method; the Colorado method; and the completely mixed feed method.

With the corn field method, the lambs are usually fed a concentrate and hay allowance in the morning at their shelter before being turned into the corn field to graze. They are usually brought in and penned at night for protection. This works out fairly well while there are plenty of leaves within their reach on the corn stalks. However, in time they are likely to pull down and push over the stalks and eat more corn than is good for them, severe death losses being experienced as a result. If this method is to be used, it should be early in the fall, and as soon as the leaves are eaten from the lower part of the corn plant, the lambs should be confined to a dry lot.

The "Colorado" method of fattening lambs is quite extensively used in the middle west. The lambs are penned at all times, but are allowed hay throughout the day. They are fed a grain allowance morning and evening in a specially constructed pen commonly termed "the lambs' dining room." The lambs reach through openings in panels to eat their hay allowance, and water troughs are provided at convenient points. By the use of this method, it is very necessary to start the lambs on a small amount of grain, gradually working up to the amount they will clean up when fed twice a day. As the grain consumption increases, the consumption of hay usually decreases correspondingly. Many sheep husbandmen supply no protein supplement when good alfalfa hay is being fed. We are of the opinion that in a good many instances under farm feeding conditions this may be a satisfactory procedure; but it depends on how fast we wish to push the lambs to fatten and finish them. Each ration used should stand on its own merits nutritionally and should be kept in balance. The nutritive ratio and total digestible material should depend on the kind of lambs and the feeding policy. Common salt and a complete mineral supplement are usually recommended and may be fed quite satisfactorily in a self feeder.

Another method of feeding lambs, one gaining rapidly in acceptance, is the use of a completely mixed ration. The intake of nutrients is thus controlled by the feeder,

instead of the lamb being able to more or less decide what and how much it will eat of the various feeds available to it. This method possesses decided advantages for some feeding programs, especially in those where extreme forced feeding is practiced. Lambs can be put up on full feed in a minimum period and usually can be kept on full feed with less difficulty and less death loss, since they must eat their hay with their grain and cannot so readily overeat of the latter. Also, the method is practical for even relatively small feeders because of the widespread distribution of grinding and mixing equipment.

Lambs are equipped with the best grinding mechanism of any of our live stock, and very little grinding or preparation of feed for them is necessary, particularly when the concentrates and hay are fed separately. We do not suggest, therefore, the purchase of an expensive grinder to prepare feed for a small number of lambs, or even for a medium or large operation if the policy of feeding for a long period is adopted. Common sense should govern in all cases. Finely ground feedstuffs are not appetizing for lambs and they may cause impactions and digestive disturbances. We usually suggest cracking of corn into four to six pieces, while barley and wheat should be cut coarsely cracked. Hay of the various kinds, particularly alfalfa hay, should be of the so-called medium grind, since if it is too fine it becomes dusty and may cause irritation in the nares and upper respiratory tract.

If the concentrates are fed separate from the hay, small ordinary troughs are used and it is very important that proper trough space be allowed for each lamb, no more and no less. All lambs should eat at the same time. If too much space is allowed, a lamb may eat its allowance at one place and then quickly go around and eat another portion at a vacant place. If not enough trough space is allowed for all to eat at the same time, some may not get their share. At the next feeding period such lambs will be exceptionally hungry and overeat on grains. Death losses may result. When a completely mixed ration is used, both of these apparent difficulties are eliminated if the feeder regulates his rations properly, always providing a concentration consistent with the tolerance of the lamb.

A Result of Overeating.—Photo by Baker

Starting rations for lamb feeding should be a good fill of a light carbonaceous hay or similar roughage. Lacking a proper fill, a lamb is likely to overeat other feeds later, particularly grain, and considerable trouble may be experienced. After a proper filling, the lamb may be started on grain or combined concentrate and ground hay if the completely mixed ration method is being employed. As has been stated, the percentage of grain to begin with should be comparatively small. It should be built up gradually to a point where the lamb is on full feed. The length of time required for this will depend a great deal on the feeding method. Good, strong, vigorous lambs weighing in the neighborhood of 65 to 70 pounds have been known to go onto full feed, a 60% grain ration, in two weeks. Heavier classes may go onto full feed even more quickly. Lighter lambs should be started on a 15 to 20% grain ration, with protein and mineral supplements in adequate amount. Prairie hay may be fed *ad libitum* to supply sufficient roughage. The percentage of grain is built up gradually and the roughage reduced accordingly until the animals receive all they will eat of a ration of which grain makes up 60%.

The digestive nutrients necessary for the

fattening of lambs according to the Morrison standards, with a few revisions, are for the 50 to 60 pound lamb a total of 1.9 to 2.5 pounds of dry matter, containing 0.16 to 0.23 pounds of digestible protein and 1.2 to 1.8 pounds of total digestible nutrients, with a ratio of protein to other digestible nutrients of 1:6.5. The middle class, weighing 60 to 70 pounds, can tolerate an increase to a total dry matter of approximately 2.5 to 2.7 pounds, with from 0.23 to 0.24 pounds of digestible protein and total digestible nutrient content of 1.8 to 2.0 pounds, and a nutritive ratio of 1:6.7 or 1:7. In the heavier classifications, 70 to 80-pound lambs, in order to produce a carcass that has a well-distributed fat, 2.7 to 2.8 pounds of dry matter, with a total digestible protein content of 0.25 pounds and total digestible nutrients of approximately 2.25 pounds, should be fed. The nutritive ratio should then be 1:7.25 or 1:7.5.

No hard and fast rules can be laid down for all lamb feeding operations. It is quite unusual to have any two bunches of lambs, even of the same breeding and average live weight, perform the same in the feed lot. After all, the old saying of "the eye of the master fattens his live stock," is as true of lambs as of any other live stock.

Any detailed discussion of nutritive ratios, adequate rations, and balanced rations would exceed in length the proprieties in this case. To demonstrate these points briefly, two exemplary rations may be cited. The first ration is one that is adequate in all respects and about the maximum in concentration that good vigorous 80-pound lambs should be expected to tolerate in cold weather. This ration contains:

65% coarsely cracked corn, No. 2 yellow grade.

30% alfalfa molasses meal, made on the basis of 25% cane molasses.

5% protein supplement composed of half soy bean oil meal and half digester tankage.

These ingredients are fed mixed thoroughly, and supplemented with salt and a complete mineral mixture fed free choice and prairie hay fed ad lib. for additional roughage. This ration has a nutritive ratio of one part of protein to 7.25 parts other digestible nutrients, with a total digestibility of 73%. The ratio of indigestible crude material to concentrates is 15 to 85. There is not much leeway for safety in this formula and its use should be considered only for a forced feeding to fatten the heavier classes of lambs. If the ingredients going into this ration are of good quality, there should be no lack of vitamins or minerals.

G. H. Williams, president, Corn States Serum Co., Omaha, Nebr. (left) and L. D. Frederick, Chief Veterinarian, Swift & Co., Chicago. The badges worn are those supplied registrants at the A. V. M. A. meeting in Columbus, Ohio, which dates this photograph August, 1936

Having considered a first-class, balanced ration adequate for full feeding and fattening, let us consider one that answers the requirements of a balanced ration if only nutritive ratio is considered. Prairie hay and cottonseed meal can be so arranged as to provide a nutritive ration to conform to what is considered proper. The main objection to this ration is that the concentrate and digestible nutrients are so low and vitamin and mineral deficiencies so apparent that it is obvious we would not get good growth nor good fattening efficiency from the use of it. It takes 94% prairie hay and 6% prime cottonseed meal to give a nutritive ratio of 1 to 7, but the digestibility is only approximately 50%. Mature sheep may be maintained fairly well on such a ration and consequently it has its place, but not for the fattening of lambs. In other words, all nutritive elements and factors must be considered and provided when one is prescribing a balanced ration, and the ration must be adapted to the kind and condition of the animal and to the purpose for which it is fed.

Abdominal Rupture in a Gelding from Goring

July 2, 1940, Dr. C. H. Kennedy, Parsons, Kansas, was called to a farm to treat a horse which had been attacked by a bull about two hours previously.

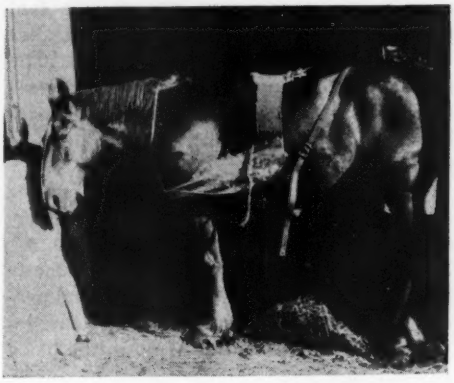
History.—The injured animal, a sorrel gelding of the all-purpose type, was about 13 years of age. It had been gored when it attempted to eat with a young Jersey bull.

There was a puncture just posterior to the diaphragm, about four inches long and almost on the median line. At the time we arrived a portion of the small intestine was hanging from the wound in a mass about the size of a man's head. It was considerably congested. The farm hands had kept the animal on its feet and had protected the wound from flies and other sources of infection with clean towels.

Treatment.—A dose of 2½ ounces of chloral hydrate was given intravenously. An additional dose of six drams was followed by complete anesthesia in about seven minutes. The animal was placed in lateral recumbency, and the intestine and the wound were thoroughly washed with a physiological saline solution. It was found to be impossible to replace the strangulated portion of the intestine by manipulation while the horse was lying on its side. Using a cream-can and a large oil drum as props, the animal was placed in dorsal recumbency, and the organ was then easily returned to its normal position.

Continuous sutures of No. 2 chromic 20-day catgut were placed in the peritoneum. Then all muscle and tendinous tissues of the region, the linea alba, abdominal tunic, the aponeuroses of the internal and external oblique abdominal muscles, the transverse abdominal muscle and the rectus abdominis were sutured with the same material, once with a continuous suture and again with an interrupted stitch. The fleshy part of the posterior deep pectoral muscle was closed with a mattress suture, and the skin with a double strand of linen, mattress type.

A pack saturated with a 1:1000 alcoholic solution of bichloride of mercury was applied to the wound, and some bichloride of mercury tablets were left with the owner to be used in redressing it. Sixteen, 60-grain sulfanilamide tablets were left to be given orally in four doses at 12-hour intervals.



After the operation, with the supporting harness in place

A supporting harness for the wound and pack was constructed of a piece of six-inch pulley belting extending around the animal and over the pack and wound. Straps extended forward to a strap around the neck to prevent the belt from slipping posteriorly and a crouper and back straps were used to prevent it from sliding forward.

Four hours after the anesthesia was given the horse was on its feet. The temperature, taken twice daily, remained normal until the fourth day, when it rose to 101.8°F. The following day it returned to normal. Although the animal was very resistant to movement, its appetite was nearly normal. The pulse was very rapid and weak, and considerable edema was apparent, especially on the right side, where it extended posteriorly nearly to the flanks. The respiratory movements remained nearly normal.

Early the sixth day the horse wandered some 70 yards, and as the owner led it back he noticed that the animal was becoming very weak. It was found dead later that morning.

JACK MEDARIS, K. S. C. '41.
Manhattan, Kans.

Diaphragmatic Hernia in a Cow

January 22, 1940, a shorthorn cow, six and one-half years old, was presented for treatment. The animal was recumbent, and had been so for three days. The owner had purchased her recently at which time her weight was estimated at 900 pounds. The initial symptoms noticed by the owner were: gradual loss of flesh, anorexia, the slobbering of a brownish fluid, and reluctance to move.

The animal was *in extremis*, and the symptoms were of little assistance in making a diagnosis. The temperature was 97° F., pulse 75, and the respirations distinctly labored and irregular. Auscultation and percussion of the chest and abdominal cavities were negative. The result of a routine blood examination was:

Total Cell Count:

R.B.C.	4,200,000
W.B.C.	4,600
Hb. (gm/100cc)	7.5

Differential Cell Count:

Esinophiles	0
Basophiles	0
Myelocytes	0
Juveniles	4
Stab forms	37
Segmenters	25
Lymphocytes:	
Large	11
Atypical	7
Small	16
Monocytes	0

Post-mortem examination revealed displacement of the thoracic organs. The heart especially deviated from its normal position. A portion of the reticulum was protruding through a rent in the diaphragm. The opening, located approximately in the center of the diaphragm, was six inches in diameter; the edges were rounded and indurated, suggesting that the injury was not of recent origin. The reticulum protruded through the rent posterior to the heart. The resulting severe digestive upset probably caused the left shift observed in the blood examination. The estimated weight at the time of the animal's death was 750 pounds.

The number of cases of diaphragmatic hernia reported in cattle is extremely small, in comparison to the number in equine and canine subjects. Danks[1] reported a case of diaphragmatic hernia in a cow, and is of the opinion, that vomiting is rather a constant symptom in displacement of the forestomachs. The slobbering noticed by the owner may have been vomitus.

St. Louis, Mo. ROY L. MESENBRINK.

[1] Danks, A. G., 1939. *Cor. Vet.*, Oct., p. 420.

* * * *

Dystocia Due to Complete Occlusion of the Vagina

A three-year-old Jersey cow was presented for treatment with the following history:

An embryotomy had been performed on this animal the previous year. According to the owner's records, she was due to calve June 17th. The owner noticed on May 18th that she had gone off feed and was lying around, and on the morning of the following day she commenced showing signs of dystocia.

Upon manual examination the vagina was found to be completely occluded just anterior to the urethral orifice. Cesarian section was advised.

Treatment.—Anesthesia was obtained with 20cc of a 2 per cent procaine solution injected epidurally. The animal was placed on the right side and an area just to the left of the median line from the udder to the umbilicus was cleaned and shaved.

A longitudinal incision was made through the skin and abdominal muscles, and perpendicular incision through the peritoneum. The fetus, which had apparently been dead for some time and had undergone some decomposition, was removed.

By placing one hand in the uterus, the operator was able to force an opening through the occlusion of the vagina sufficient to allow drainage. The uterus was then cleaned up and closed with a double row of Lembert sutures. The peritoneum and muscles were closed with a continuous suture and the skin incision with a mattress suture.

Later medication consisted of 250cc of dextrose following the operation and sulfanilamide on the second and third days. The animal made an uneventful recovery.

Saguache, Colo. G. J. MAROLD.

Bang's disease vaccination now officially endorsed—

BRUCELLA ABORTUS VACCINE
Lederle

Calfhood vaccination received official adoption by the U. S. Bureau of Animal Industry as a part of the Federal Bang's disease control program in December, 1940.

The excellent results obtained from several years of experimental studies and field application by the U. S. Bureau of Animal Industry, and other investigators, have resulted in the above announcement.

"Brucella Abortus Vaccine *Lederle*" is an active, highly antigenic vaccine, capable of inducing a high degree of resistance in vaccinated animals.

It is important that the vaccine used be a pure, highly antigenic culture of fully viable organisms, prepared from a B. Abortus strain of low virulence (Strain No. 19).

Lederle's B. Abortus Vaccine has always been highly antigenic and so marketed that it retains its viability until used.

Detailed information on request

PACKAGES:

"BRUCELLA ABORTUS VACCINE *Lederle*"

1—5 cc. vial
6—5 cc. vials
10 immunizations (50 cc. vial)

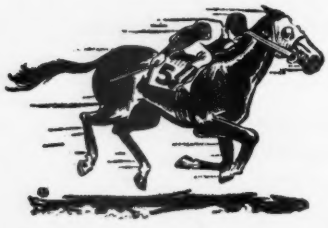
LEDERLE LABORATORIES, INC.
30 ROCKEFELLER PLAZA NEW YORK, N. Y.

You'll Be Interested to Know That . . .

When an up-to-date article on nutrition appears in which vitamin B_1 is not even mentioned, that's news! L. D. Frederick's excellent discussion of sheep nutrition this month (page 164) falls into that category. . . . The answer is, of course, that thiamin deficiency is relatively rare in sheep fed the usual rations. When it does occur, the animals fall ill rather suddenly and die in convulsions. Opisthotonos is the most characteristic symptom; necropsy reveals few changes, but histological examination shows lesions indicative of encephalomalacia.

■

According to a recent article in the *New York Times*, more than half a million dogs have been killed in Britain since the war began . . . About 100,000 were destroyed at the outbreak of the war at the request of nervous owners, and another 100,000 when the heavy raids began and homes were evacuated. Three hundred thousand have been killed by bombing, blackout accidents, and rationing difficulties . . . The Royal Society for the Prevention of Cruelty to Animals, which is still submitting more than 10,000 dogs monthly to euthanasia, is seriously perturbed by this wastage, as it is possible in hundreds of cases to find new homes for the animals.



The Cleveland *News* recently commented editorially on the fact that the heart, brains, thyroid, and adrenal glands of Sarazen, noted race horse of the 1920's, have been brought to Cleveland for examination by Drs. George W. Crile and Daniel P. Quiring, who found in a similar study of the late Equipoise that a horse's body is controlled by a definitely limited bodily cooling system. This implies, among other things, that if a horse could somehow be persuaded to run fast enough to please the most exacting grandstand customer, it would simply die of heat prostration. . . . As the *News* points out, "If a horse runs too hard, it overheats itself. If it doesn't run fast enough, it overheats man. Prostration out on the track, or prostration up in the grandstand —a depressing spectacle in either case."

We liked a bit of "filler" in the *M. S. C. Veterinarian*: "If you get paid for failing, yet often do your best work without hope of pay, your trade is called a profession." . . . A nice distinction!

■

Dr. Clarence L. Campbell (O. S. U. '26), has been appointed Director of Veterinary Sales of Lederle Laboratories, Inc., to fill the vacancy caused by the death of C. M. Hutchins . . . Dr. J. T. Burriss (O. S. U. '31), has succeeded the late Earl P. Maxwell as president and general manager of the Columbus Serum Company . . . Dr. L. P. Deubler (U. of P.) has been named to the staff of the Sharp & Dohme Medical-Research Division to assist in developing new products and making professional contacts.

■

Twenty-five years ago the United States was much excited over the possibility of entrance into the current European war. In an editorial (March, 1916) entitled Veterinarians and Preparedness, *Veterinary Medicine* quoted Dr. R. Vans Agnew as stating that "army experts estimate that the United States would require an army of two million men as soon as it could possibly be raised if it should become involved in war with any major power, and for such an army seven thousand veterinarians would be immediately required." . . . He undertook to begin enrolling this number. This was the first reference in American veterinary literature to a veterinary reserve corps.

■

We always enjoy reading *The Bloodless Phlebotomist*, a little journal published by the Denver Chemical Manufacturing Company for circulation among members of the medical and allied professions throughout the world. Normally some 1,500,000 copies, in 15 languages, are sent out; war conditions have limited its distribution this year to English, Spanish and Portuguese speaking countries outside the war zone . . . The primary purpose of the publication is to acquaint its readers with Antiphlogistine and Galatest, but its pages are enlivened with all sorts of medical items and oddments; for example, from the last number we learned about a five-year-old human mother, and about an Irish hospital that has never had a patient . . . The Denver Chemical Manufacturing Co. (163 Varick St., New York) will send *The Bloodless Phlebotomist* free to any veterinarian who asks to be placed on their list.

YESTERDAY:
... a pathological mystery

TODAY: *spectacular recovery!*

That Parturient Paresis (Milk Fever) is no longer a pathological mystery is an outstanding and lasting tribute to the veterinary profession.

Although it has been only a few years since the etiology of the disease was clearly defined as an acute hypocalcemia, the therapeutic results obtained thus far with parenteral calcium compound have been little short of dramatic.

Calcium Levulinate, Injectable—Abbott's contribution to more efficient calcium therapy—in addition to offering the convenience and safety of ***intravenous*** technique, overcomes two shortcomings of certain other calcium compounds. First, it requires no stabilizing agent. Second, it has a relatively higher calcium content.

Thus the 15% w/v solution of Calcium Levulinate, Abbott, is approximately equivalent in calcium content to 25% w/v calcium gluconate; or one 350-cc. container furnishes the same amount of calcium as 87.5 Gm. calcium gluconate.

In parturient paresis of cows or in the treatment of other blood calcium deficiencies, the dose of Calcium Levulinate is 250 to 350-cc. depending upon the size of the animal and the duration and severity of attack. The dose may be repeated, when indicated, in one to two hours. In preventive treatment, 150 to 250-cc. may be administered at the time of calving.

Calcium Levulinate, Injectable, Abbott, is stable, sterile and ready for use. It is supplied in 350-cc. bulk containers, singly, or in boxes of 6. Abbott Laboratories, North Chicago, Ill.

CALCIUM LEVULINATE
Injectable
ABBOTT

ANOTHER REMINISCENCE OF 1918

This cartoon, like that presented on this page last month, was drawn by an enlisted member of the Veterinary Corps at the Medical Officers' Training Camp, Fort Riley, Kansas

"CRITICAL MOMENTS IN THE VET CORPS."

The Rookie and his First Experience of an Army dinner—

Front Royal Quartermaster Depot, Front Royal, Va.; 1st Lt. Floyd W. Koebel, to Holabird Quartermaster Depot, Baltimore, Md.; all during the month of January.

Continued on Active Duty.—1st Lt. Burton C. Thomson, until Feb. 25, 1942.

Transfers.—1st Lts. Olin A. Anderson, from Presidio of San Francisco, Calif., to Fort Rosecrans, Calif., Jan. 21; Samuel E. Grove, from the station hospital, Fort Sam Houston, Tex., to San Antonio General Depot, Fort Worth Branch, Fort Worth, Tex., Jan. 29; William R. Hulbush, from Fort Lewis, Wash., to the 99th Field Artillery at that station; Clayton H.

Blue Ribbon Ointments

• **CRYATE DRESSING**
An all purpose inhibitory antiseptic ointment used wherever the skin is broken.

• • **BETHAIN DRESSING**
The local anesthetic ointment for the control of localized pain in denuded skin surfaces.

• • • **ZOIC DRESSING**
An outstanding ointment for the treatment of parasitic conditions of the skin.

Packaged in 17 ounce Jars **$3.00 each net**

Literature upon request.

Detroit Veterinary Supply Co.

1792-98 Wabash Ave. **Detroit, Michigan**

Canadian Branch—Windsor, Ont.

Mickelson, from Los Angeles, Calif., to Air Corps Advance Flying School, Stockton, Calif., Jan. 31.

Promotions.—To Major (temporary): Capts. William M. Lukens, Jan. 9, 1941, and Leslie H. Baker, Jan. 21, 1941.

To Captain: 1st Lt. Richard H. Jurden, Dec. 31, 1940.

Meat Inspection Course.—The following officers, now on active duty, are ordered to report at the Chicago Quartermaster Depot February 10, 1941, for a 30-day course of instruction in the inspection of meat, meat-food, and dairy products: Capts. Max H. Carlin, Ft. Adams, R. I.; Andy W. Crawford, Camp Blanding, Fla.; and Vaughn E. Ishee, Ft. Knox, Ky.; 1st Lts. Geo. W. Snook, Ft. DuPont, Del.; Geo. Walmsley, Ft. Banks, Mass.; John J. Keane, Camp Edwards, Mass., Ralph A. Maxwell, Camp Upton, N. Y.; Paul F. Landis, Ft. Monroe, Va.; Hugh D. Smith, Camp Beauregard, La.; Benners B. Vail, Camp Shelby, Miss.; Alan W. Winter, Ft. Custer, Mich.; Thomas M. Eagle, Jefferson Bks., Mo.; J. B. Couch, Edwin A. Beckcom, Jr., and James W. Heaton, Jr., Ft. Sam Houston, Tex.; Wilfred S. Bentham, San Francisco Port of Embarkation; Myron Thom, 11th Cavalry, Imperial, Calif.; and Orlen L. Bailey, Ft. Geo. Wright, Washington.

Fowler Brand Anti-Hog Cholera Serum and Hog Cholera Virus

Fowler Brand Anti-Hog Cholera Serum is on hand...ready and waiting for instant use, to help make your winter immunization work easy and sure.

This *proved* serum is prepared to strict and unvarying standards of potency and purity by graduate veterinarians, men who know *your* needs.

It is manufactured under U. S. Government supervision.

It has passed Government supervised potency tests.

Serum is supplied in 100 cc., 250 cc., and 500 cc. rubber-capped bottles.

Virus is supplied in 15 cc., 30 cc., 60 cc., and 100 cc. rubber-capped bottles.

And it is available . . . *when you need it* . . . at these widespread points.

Armour Branch Houses and Creameries

Dr. Robt. D. Wall, 910 28th St., Des Moines, Iowa; Dr. Robt. J. Hoskins, 3203 E. Washington St., Indianapolis, Indiana; Mr. A. G. Carter, Findlay, Ohio; and Dr. H. W. Brown, 623 W. Main St, Fort Wayne, Indiana; and at most Armour Branch Houses and Creameries.

ARMOUR AND COMPANY

Veterinary Division • Kansas City, Kansas

Antiseptigen

Equal to Phenol as Germicide

Non-Toxic
Non-Corrosive

Pint—$0.80
Gallon—$4.75

Curts-Folse Laboratories
71 Central Avenue
Kansas City, Kansas

GOING GREAT!

The 5 NEW Starlets
in the TI-O-GA FAMILY

Write for full details on the Special Veterinary Franchise.

- ★ TI-O-GA BISCUITS, *50 lb. Bags*
- ★ TI-O-GA MEDIUM KIBBLES, *50 lb. Bags*
- ★ TI-O-GA FINE KIBBLES, *50 lb. Bags*
- ★ TI-O-GA CANNED DOG FOOD, *1 lb. Cans*
- ★ TI-O-GA BEEF RATION, *1 lb. & 2¼ lb. Cans*

BALORATIONS, Inc., Div. of Tioga Mills Inc.
Waverly, N. Y., or 202 Davis St., San Francisco, Calif.

TI·O·GA
MEAL • PELLETS • PUPPY FOODS
The Complete Foods

Federal Government Again Seeks Junior Veterinarians

The United States Civil Service Commission has announced it will again receive applications for the position of junior veterinarian in the Bureau of Animal Industry, Department of Agriculture. An insufficient number of eligibles for filling this position resulted from the examination which closed in November 1940. Qualified persons are urged to send their applications to the Commission's Washington office not later than February 17 if sent from States east of Colorado and not later than February 20, 1941, if sent from Colorado and States westward.

The salary of the position is $2,000 a year less a retirement deduction of 3½%. The duties include the inspection of food animals and food products, control and eradication of disease, and the sanitary inspection of establishments. Applicants must have completed a full course of study in a veterinary college of recognized standing. Applications will also be accepted from senior students, provided they furnish proof of completion of the veterinary course during the existence of the eligible register. Competitors will be rated on professional questions covering the theory and practice of veterinary medicine, veterinary

FISTONE

● The **original** and **successful** veterinary preparation given internally that will bring the treatment of Fistula of the Withers and other suppurative and catarrhal conditions down to a mere routine.

May we remind you that FISTONE is also unsurpassed and unequalled as a conditioning powder.

The Fistone and Appliance Company,
College Corner, Ohio.
Enclosed please find check for $8.00, for which send me one dozen 12 ounce boxes of FISTONE (Trial Order). Regular price $10.00. One-half dozen boxes $5.00.
Dr.....
Address.....

★ Oster ★
SMALL ANIMAL CLIPPER

The
All-Year
All-Purpose
Clipper

ONLY $19.50

General Clipping ● Plucking Length Clipping ● Surgical Shaving ● all are performed safely and quickly with the OSTER—the clipper with the Detachable Cutter Head.
The Instrument Size ● The Great Power ● provide a new ease and sureness when clipping.
The Smoother and Quieter Performance ease animal tension and dispel clipper fear.

JOHN OSTER MANUFACTURING COMPANY
Racine, Wisconsin, U. S. A.

FREE FOLDER FOR VETERINARIANS .. outlining the treatment of various infections with
● Also Price List quoting veterinary hospital discount price
SULFANILAMIDE SQUIBB
(Para-Amino-Benzene-Sulfonamide)
E. R. SQUIBB & SONS Veterinary and Animal Feeding Products Div 745 FIFTH AVE., NEW YORK

anatomy, physiology and pathology, and meat inspection.

Further information and application forms may be obtained from the Secretary of the Board of U. S. Civil Service Examiners at any first- or second-class post office, or from the U. S. Civil Service Commission, Washington, D. C.

■

Coming Meetings

Kansas City Veterinary Medical Association, monthly meeting, Kansas City, Mo., February 18.

Massachusetts Veterinary Association, monthly meeting, Hotel Westminster, Boston, Mass., February 26.

Louisiana Veterinary Medical Association, Tenth Annual Meeting and Short Course, Louisiana State University, Baton Rouge, La., February 26-27.

Maine Veterinary Medical Association, quarterly meeting, University of Maine, Orono, Me., April 9.

American Animal Hospital Association, Eighth Annual Meeting, Hotel Statler, Buffalo, N. Y., April 23-26.

Behind
MERCUROCHROME
(dibrom-oxymercuri-fluorescein-sodium)
H W & D *is a background of*
Precise manufacturing methods insuring uniformity
Controlled laboratory investigation
Chemical and biological control of each lot produced
Extensive clinical application
Eighteen years' acceptance by the Council on Pharmacy and Chemistry of the American Medical Association
Every H. W. & D. product is investigated and proved chemically, pharmacologically, and bacteriologically in our laboratories before marketing.
Hynson, Westcott & Dunning, Inc.
BALTIMORE, MARYLAND

Recent tests made by the Lederer
Bacteriological Laboratories show the New
THERAPOGEN
to have a wider range of action. For example,
1 part Therapogen—30 parts water
now kills *Streptococcus viridans* in 5 minutes.
THEODORE MEYER EST.
213 S. 10th St.
Philadelphia, Pa.
THERAPOGEN LTD.
2722 Yonge St.
Toronto, Canada

Dr. Naylor's Medicated Teat Dilators

A safe and dependable treatment for Spider Teats, Scab Teats, Cut and Bruised Teats, Obstructions and for keeping teat canal open after operating.

Dr. Naylor Dilators fit either large or small teats without overstretching or tearing, are easy to insert and stay IN the teat. They carry antiseptics and healing agents into teat canal to combat infection and promote healing. The dilators themselves are Medicated, Soft, Absorbent dressings which protect the inflamed area, absorb inflammatory exudates and keep teat canal open in its natural shape while tissues heal.

Price to Veterinarians

Dollar Package (contains 48 Dilators).....$8.00 Per Doz.
Fifty Cent Package (contains 18 Dilators)..... 4.00 Per Doz.
←Plain Dispensing Package (contains 15 Dilators)..... 3.00 Per Doz.

H. W. NAYLOR CO. MORRIS, N. Y.

Deaths of Veterinarians

A. G. Gruwell, Bonduel, Wis., St. Joseph Veterinary College '21, October 11.

George D. Anderson, 47, Torrington, Wyo., Kansas City Veterinary College '17, mayor of Torrington since 1938, November 21.

Frank Jelen, 71 Omaha, Neb., Kansas City Veterinary College '05, for many years in the meat inspection division of the B. A. I., December 2. Among his survivors are two sons, Frank A. Jelen (K.C.V.C. '17), state veterinarian of Nebraska, and George D. Jelen (O.S.U. '23), B. A. I. inspector in charge of meat inspection at Pittsburgh, Pa.

Michael J. Sexton, 78, Minneapolis, Minn., Ontario Veterinary College '95, December 3.

Warren L. Thayer, 67, Worcester, Mass., McGill University '97, December 13.

John T. Ferley, 70, Philadelphia, Pa., American Veterinary College, New York, practiced in Philadelphia except for a period during the War of 1914-18, when he was engaged in meat inspection for the B. A. I., member and officer of several fraternal and civic organizations, December 24.

MASON'S *Kennel Fences*

Used by Leading Dog Hospitals

5 Runs $86.25
Pens $14.65 and up

Mason's are Real Kennel Fences—Strong, Good Looking and sold under a Money Back Guarantee to hold the largest and strongest dogs.

SEND FOR FREE CATALOG

If planning a new hospital or equipment, get this book. It quotes Low Direct Factory Prices on Kennel Fences, Dog Proof Gates, Steel Kennel Stalls and Doors.

54 Pages 147 Illustrations

MASON KENNEL FENCE CO., Box 77, Leesburg, Ohio

Fred Carlton Bigelow, 65, Carlisle, Pa., University of Pennsylvania '05, practiced at Carlisle 35 years, Veteran of War of 1914-18, December 25.

Perry L. Varble, 53, Bloomington, Ill., Kansas City Veterinary College '10, in the meat

RESULTS-OR-REPLACEMENT

M·A·C

ACCEPTED AND USED BY THE VETERINARY PROFESSION SINCE 1900

IN THE TREATMENT OF EQUINE LAMENESS INVOLVING BONE, BURSA OR TENDON

"M. A. C. HAS NEVER BEEN SUCCESSFULLY IMITATED"

CARTER-LUFF CHEMICAL CO., HUDSON, N.Y.

PRICES

SINGLE BOTTLE $ 2.00
¼ DOZEN
1 BOTTLE FREE 5.00
½ DOZEN
2 BOTTLES FREE 8.00
1 DOZEN
4 BOTTLES FREE 15.00
2 DOZEN
4 BOTTLES FREE 25.00

AGENTS SOUTHERN STATES
Kentucky Serum Co.
LOUISVILLE, KY.

FOR PRICES IN CANADA WRITE TO
Wingate Chemical Co.
MONTREAL

inspection division of the B. A. I. until 1923, when he became McLean County Veterinarian, December 29.

David Ross Lindsay, 57, Anthony, Kans., Kansas City Veterinary College '10, January 8. Doctor Lindsay was killed in an automobile accident on his way to the Kansas Veterinary Medical Association meeting.

C. W. Jones, 82, Knoxville, Ia., practiced in Knoxville over 40 years, January 1.

W. G. Zimmerman, 73, Smithville, Ohio, Ontario Veterinary College '92, practiced in Smithville, his home town, for 46 years, January 4.

O. W. Rowe, 75, Keokuk, Ill., veterinarian and automobile dealer, January 10.

William A. Smith, Heron Lake, Minn., January 13.

C. E. Brill, 57, Moundsville, West Virginia, for four years deputy warden of the state penitentiary, January 21.

Mrs. Mabel Armstrong, wife of Walter E. Armstrong, vice president and sales manager of Gaines Food Co., Inc., formerly vice president and general manager of Chappel Bros., Inc., died Feb. 1. Mrs. Armstrong was noted as a breeder of Wire Fox Terriers, and from her kennels came a number of outstanding bench champions. She was especially active in dog-show circles, and well known in the Mid-West and in the East.

THE VETERINARY RECORD

Founded 1888

A weekly journal for the Profession.

Published by the

NATIONAL VETERINARY MEDICAL ASSOCIATION

of Great Britain and Ireland

36 Gordon Square

LONDON W. C. 1.

ENGLAND

Subscription, £2.12.6 per annum.

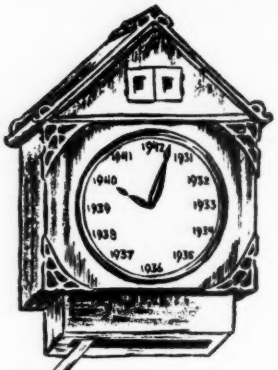
BOOST VITALITY DOG FOODS

Regardless of whether or not you *sell* dog foods, you need not hesitate to *boost Vitality* to your patrons. You can recommend VITALITY DOG FOODS purely on the grounds of outright HIGH QUALITY, with the assurance that every needed nutritional factor is amply provided.

For more complete information write . . .

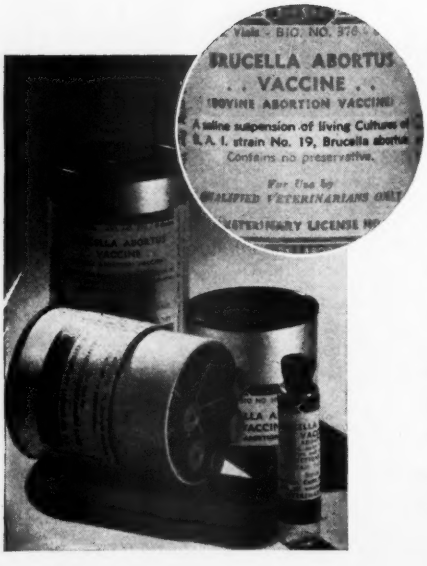
VITALITY MILLS Dept. VM-3, Board of Trade Chicago, Illinois

Dr. John R. Mohler, chief of the U.S.B.A.I., recommends calfhood vaccination in Bang's Disease control. His plan is endorsed by the U. S. Live Stock Sanitary Association (see story in January issue of **Veterinary Medicine,** pp. 20-21; 24).



THE PENDULUM IS ~~SWINGING~~ *has Swung*

to official endorsement of Brucellosis Vaccination



Jen-Sal

BRUCELLA ABORTUS VACCINE

(BOVINE ABORTION VACCINE)

(Prepared from U.S.B.A.I. Strain No. 19 only)

Every serial lot is tested by our Laboratories and retested by Government Laboratories in Washington, D. C., before it is released for field use.

60 c.c. vial (12 calf doses), Bio. No. 380 . . . . $2.28
1-5 c.c. (1 calf dose), Bio. No. 370 . . . . . 0.25
6-5 c.c. (6 calf doses), Bio. No. 376 . . . . . 1.30

JENSEN-SALSBERY LABORATORIES, INC.
KANSAS CITY, MISSOURI